

TUpH™ Submersion/Insertion pH/ORP Sensors

Specifications

Sensor Type: TUpH 396P, 396 PVP; GPLR hemi or flat glass

Range: * pH: 0–14

ORP: -1500 to 1500 mv

Percent Linearity*		
pH Range	GPLR hemi bulb	GPLR flat bulb
0 – 2 pH	94%	–
2 – 12 pH	97%	98%
12 – 13 pH	98%	95%
13 – 14 pH	98%	–

Pressure Range-Hemi bulb: 100–1136 kPa [abs]
(0–150 psig)

Temperature Range: 0–100 °C (32–212 °F)

Pressure Range-Flat bulb: 100–790 kPa [abs]
(0–100 psig)

Minimum Conductivity: 75 µS/cm, min; 100 µS/cm nominal

Flow Rate: up to 2 ft/sec

Wetted Materials: Titanium, Polypropylene, EPDM, glass; platinum (ORP only)

Process Connection: 1 in. MNPT front and rear facing threads

Integral Cable: 396P: (-01) -25 ft; (02) -15 ft coaxial

VP8 Cable: use PN 24281-00 15ft VP8 cable

Preamplifier Options:

396P: Remote or Integral SMART (-01)

396PVP: Remote or Integral SMART (-70)

Weight/Shipping Weight: 0.45 kg/0.9 kg (1 lb/2 lb)

⚠ WARNING

Before removing the sensor, be absolutely certain that the process pressure is reduced to 0 psig and the process temperature is lowered to a safe level!

⚠ WARNING

Glass electrode must be wetted at all times (in storage and in line) to maximize sensor life.

CAUTION

SENSOR/PROCESS APPLICATION COMPATIBILITY

The wetted sensor materials may not be compatible with process composition and operating conditions. Application compatibility is entirely the responsibility of the user.

CAUTION

The buffer in the protective boot may cause skin or eye irritation.

ATEX DIRECTIVE

Special Conditions for safe use

1. All pH/ORP sensors have a plastic enclosure which must only be cleaned with a damp cloth to avoid the danger due to a build up of an electrostatic charge.
2. All pH/ORP sensor Models are intended to be in contact with the process fluid and may not meet the 500V r.m.s. a.c. test to earth. This must be taken into consideration at installation.

Storage

1. It is recommended that electrodes be stored in their original shipping containers until needed.
2. Do not store at temperatures below -5°C (23°F).
3. Electrodes should be stored with a protective cap containing KCl solution.
4. For overnight storage, immerse the sensor in tap water or 4 pH buffer solution.
5. A pH glass electrode does have a limited shelf life of one year.

Electrode preparation

1. Remove electrode from shipping container.
2. Remove the protective boot covering the electrode bulb.
3. For pH electrode, rinse away salt film with clean water, then shake the electrode so that the internal solution fills the bulb, thus removing any air trapped there.

Note

Do not allow lubricant to coat electrode bulb or reference junction. If it does, wipe it clean before installation.

Installation

For sensor dimensions, see Figure 1.

For sensor orientation, see Figure 2.

For VP sensor or -02 sensor (no preamp) wiring, see Figures 3 thru 22.

For -01 sensor (with preamp) wiring, see Figures 23 thru 28.

Two Point Buffer Calibration

Select two stable buffer solutions, preferably pH 4.0 and 10.0 (pH buffers other than pH 4.0 and pH 10.0 can be used as long as the pH values are at least two pH units apart).

Note

A pH 7 buffer solution reads a mV value of approx. zero, and pH buffers read approximately ± 59.1 mV for each pH unit above or below pH 7. Check the pH buffer manufacturer specifications for millivolt values at various temperatures since it may affect the actual value of the buffer solution mV/pH value.

1. Immerse sensor in the first buffer solution. Allow sensor to equilibrate to the buffer temperature (to avoid errors due to temperature differences between the buffer solution and sensor temperature) and wait for reading to stabilize. Value of buffer can now be acknowledged by analyzer/transmitter.
2. Once the first buffer has been acknowledged by the analyzer/transmitter, rinse the buffer solution off of the sensor with distilled or deionized water.
3. Repeat steps 1 and 2 using the second buffer solution.
4. The theoretical slope value, according to the Nernst equation for calculating pH, is approximately 59.17 mV/pH. Over time the sensor will age, both in the process and in storage, and will result in reduced slope values. To ensure accurate readings, it is recommended that the electrode be replaced when the slope value falls below 47 to 49 mV/pH.

Recommended pH Sensor Standardization

For maximum accuracy, the sensor can be standardized on-line or with a process grab sample after a buffer calibration has been performed and the sensor has been conditioned to the process. Standardization accounts for the sensor junction potential and other interferences. Standardization will not change the sensor's slope but will simply adjust the analyzer's reading to match that of the known process pH.

Maintenance for pH Electrode

Electrodes should respond rapidly. Sluggishness, offsets, and erratic readings are indicators that the electrodes may need cleaning or replacement.

1. To remove oil deposit, clean the electrode with a mild non-abrasive detergent.
2. To remove scale deposits, soak electrodes for 30 to 60 minutes in a 5% hydrochloric acid solution.
3. Temperature effect on life expectancy: If glass electrode life expectancy is 100% @ 25°C (77°F), then it will be approximately 25% @ 80°C (176°F).

ORP Calibration

1. After making an electrical connection between the sensor and the instrument, obtain a standard solution of saturated quinhydrone. This can also be made quite simply by adding a few crystals of quinhydrone to either pH 4 or pH 7 buffer. Quinhydrone is only slightly soluble, therefore only a few crystals will be required.
2. Immerse the sensor in the standard solution. Allow 1–2 minutes for the ORP sensor to stabilize.
3. Adjust the standardize control of the instrument to the solution value shown in the table below. The resulting potentials, measured with a clean platinum electrode and saturated KCl/AgCl reference electrode, should be within ± 20 millivolts of the value shown in the table below. Solution temperature must be noted to ensure accurate interpretation of results. The ORP value of saturated quinhydrone solution is not stable over long periods of time. Therefore, these standards should be made up fresh each time they are used.
4. Remove the sensor from the buffer, rinse, and install in the process.

Maintenance for ORP Electrode

Electrodes should respond rapidly. Sluggishness, offsets, and erratic readings are indicators that the electrodes may need cleaning or replacement.

1. To remove oil deposit, clean the electrode with a mild non-abrasive detergent.
2. To remove scale deposits, soak electrodes for 30 to 60 minutes in a 5% hydrochloric acid solution.
3. ORP (metallic) electrodes should be polished with moistened baking soda.

	pH 4 Solution			pH 7 Solution		
Temp °C	20	25	30	20	25	30
mV Potential	268	264	260	94	87	80

Installation

Figure 1. Dimensional Drawing

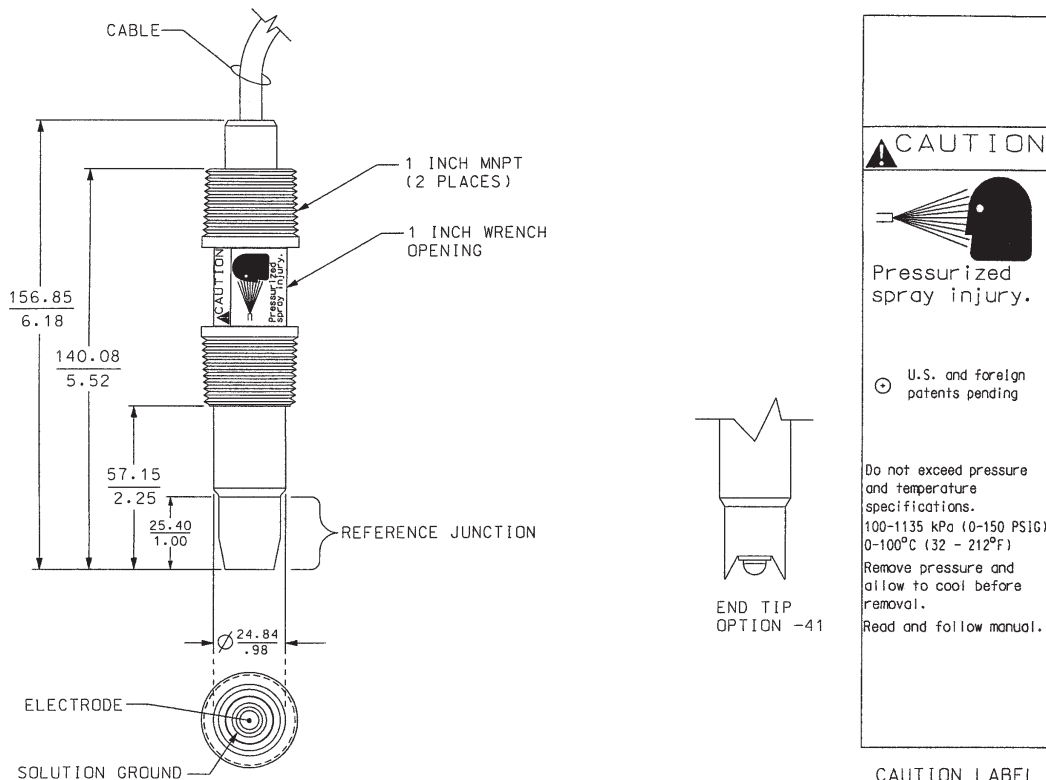


Figure 2. Flow Through and Insertion Installation

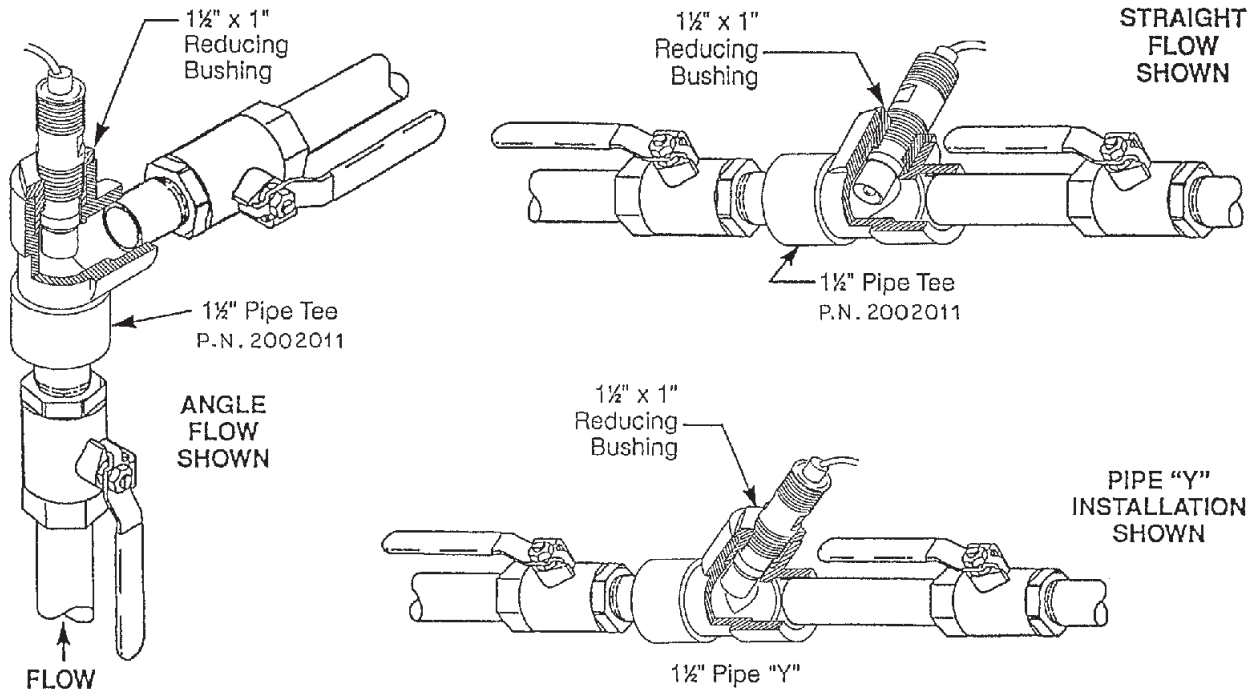


Figure 3. Wiring for 81

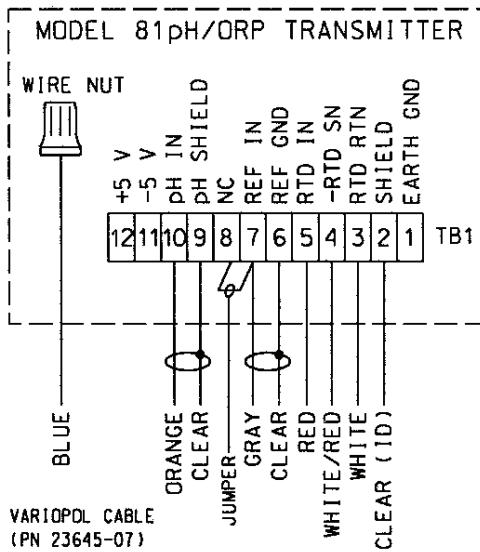


Figure 4. Wiring for 1181

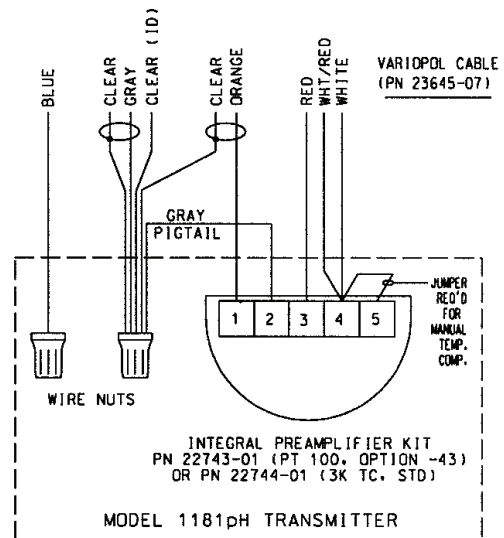


Figure 5. Wiring 81 through Remote Junction Box

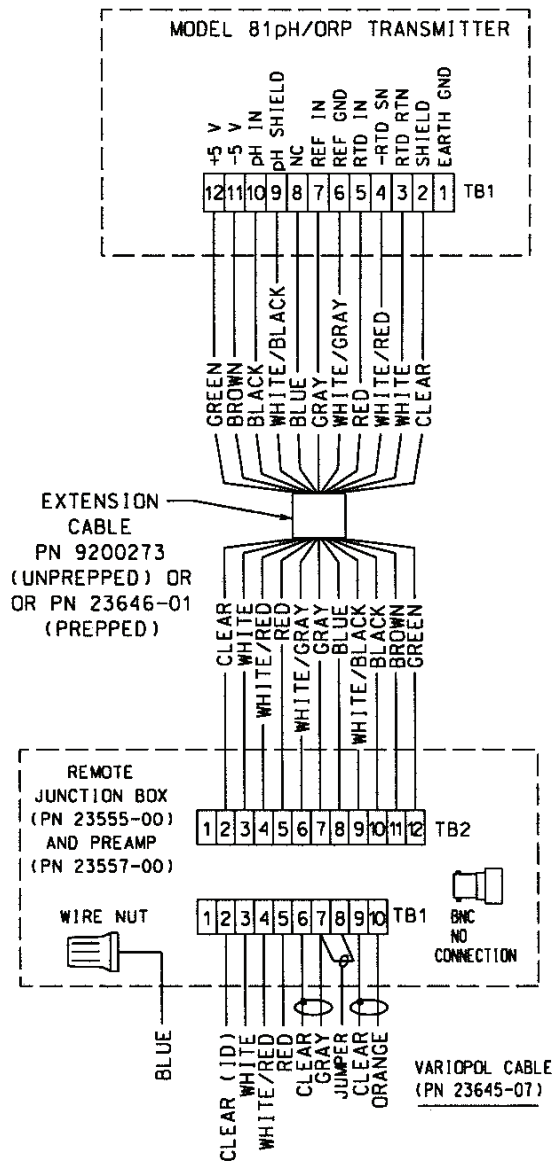


Figure 6. Wiring 1181, 1050/1060, and 1003/1023 through Remote Junction Box

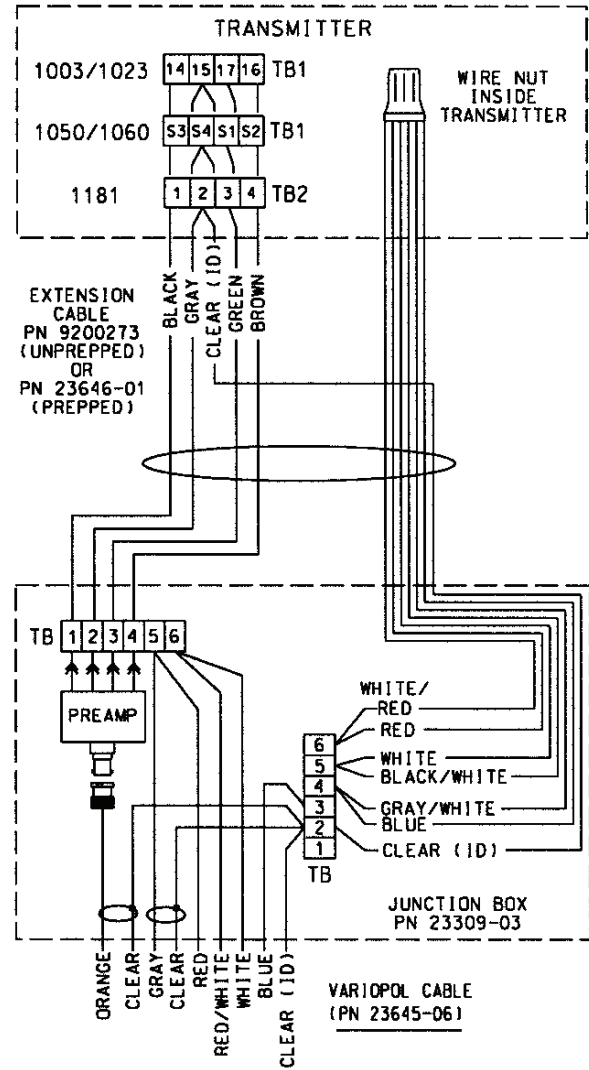


Figure 7. Wiring Details of 396P-01-50 for use with and without Junction Box (PN 22719-02) for 1181, 1050, and 1060.

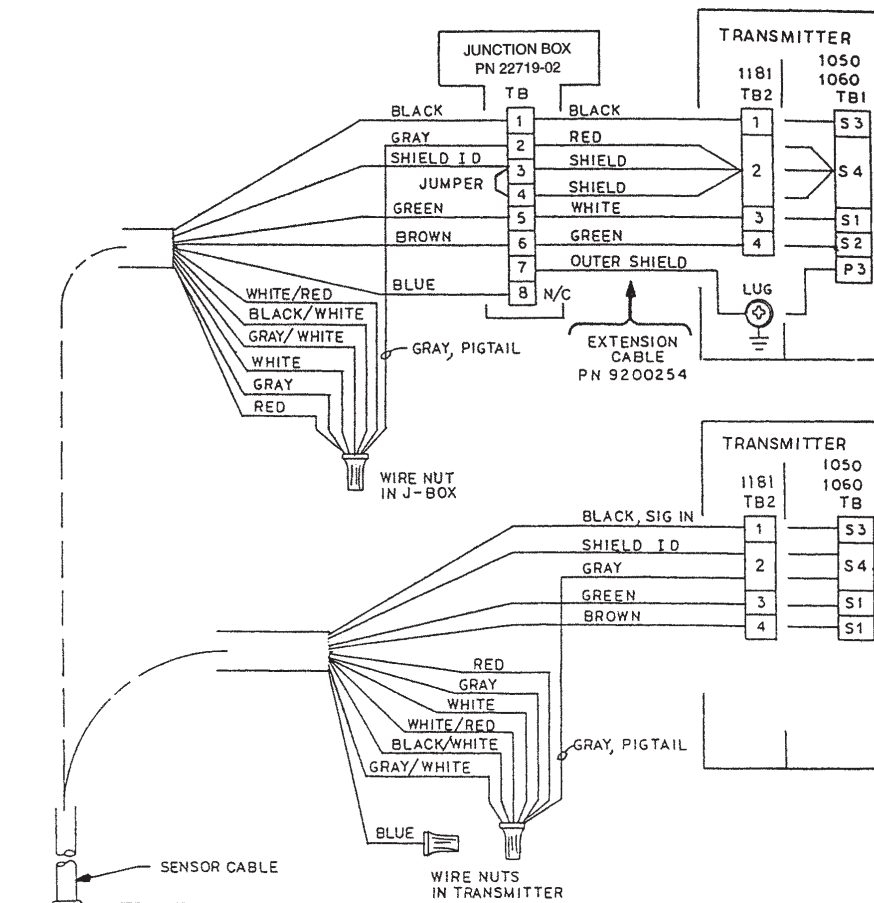


Figure 8. Wiring for 2081

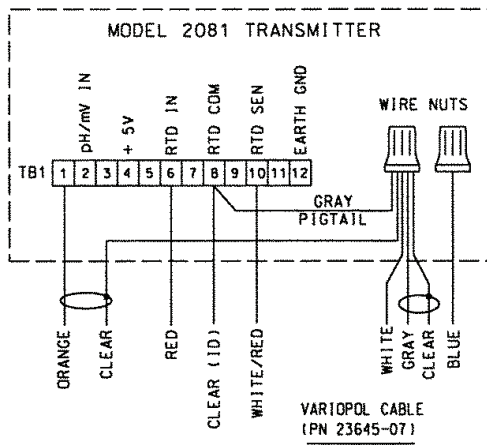


Figure 9. Wiring for 3081, 4081

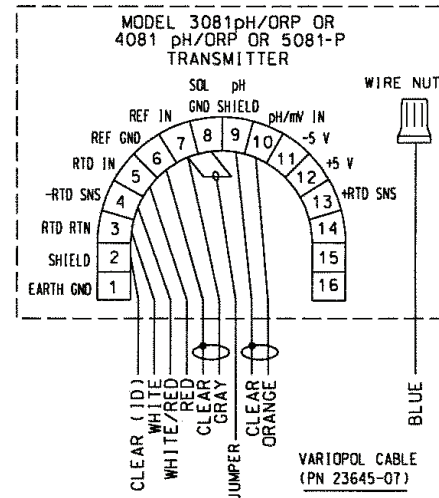


Figure 10. Wiring 2081 through Remote Junction Box

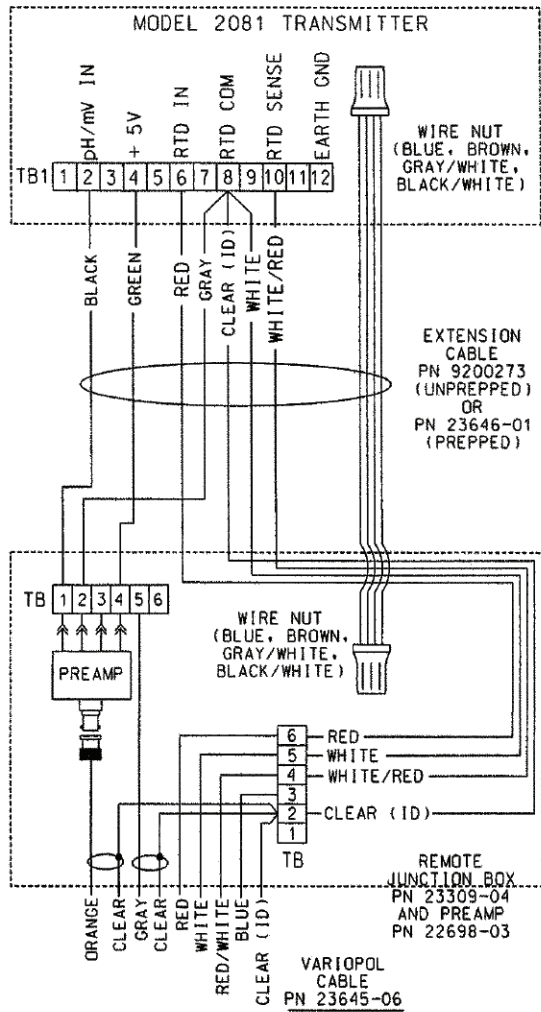


Figure 11. Wiring 3081, 4081 through Remote Junction Box

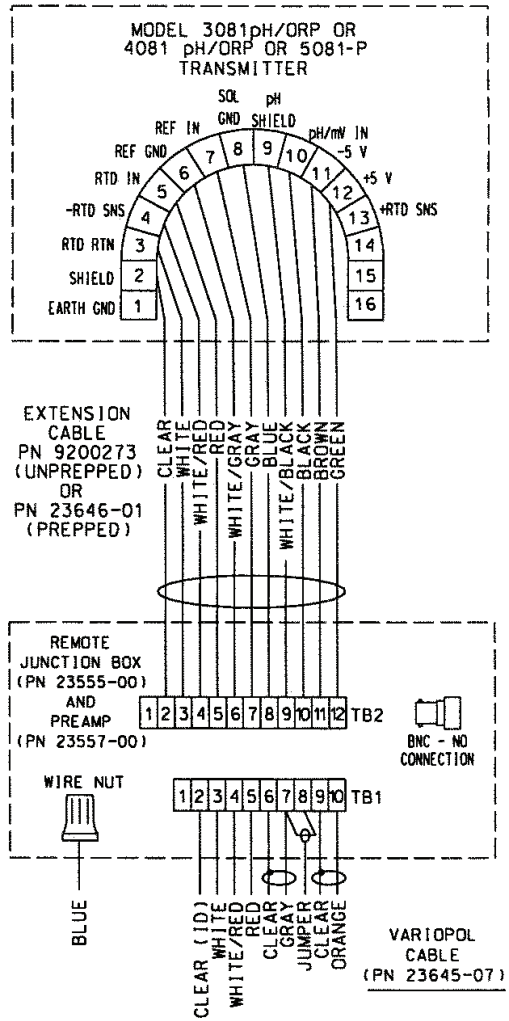


Figure 12. Wiring for 1054 A/B and 2054

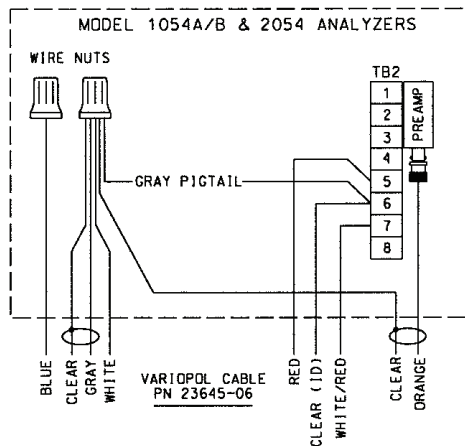


Figure 13. Wiring 1054 A/B and 2054 Through a Remote Junction Box

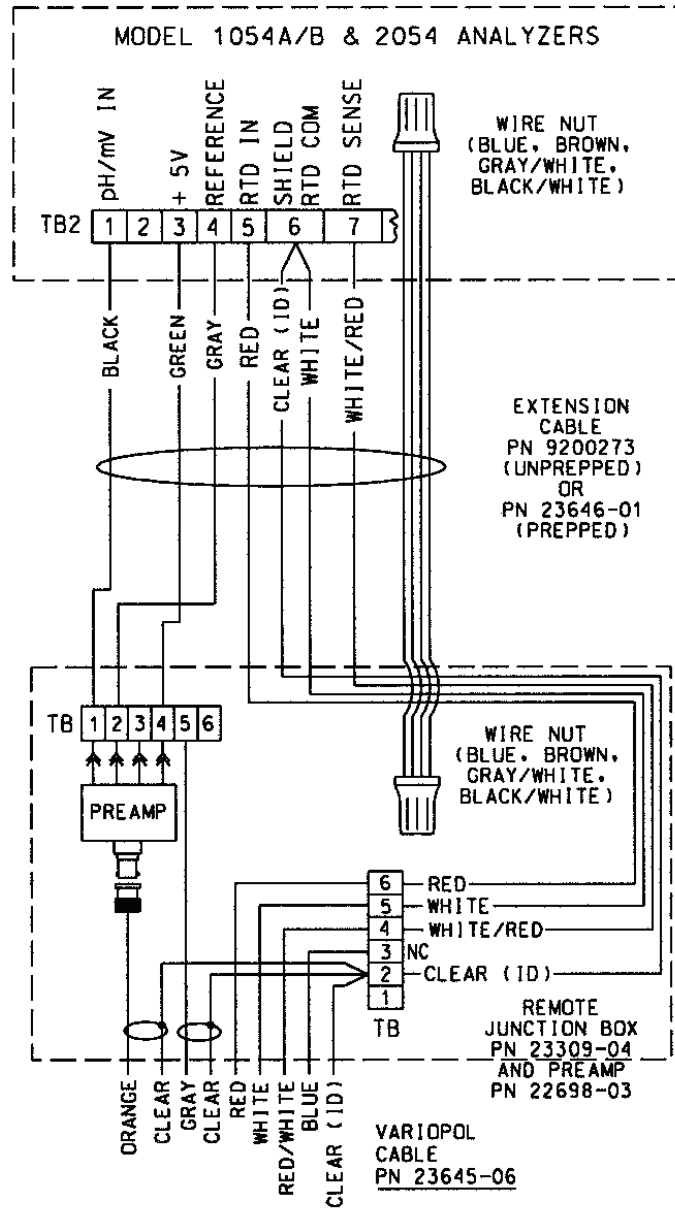
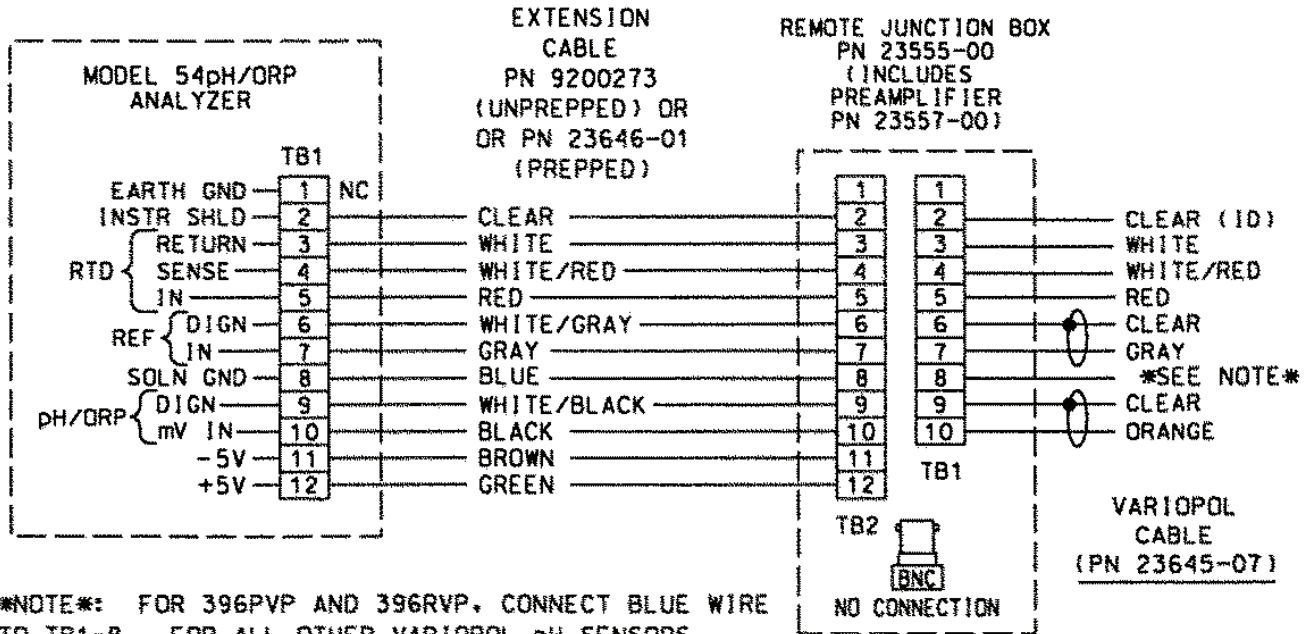
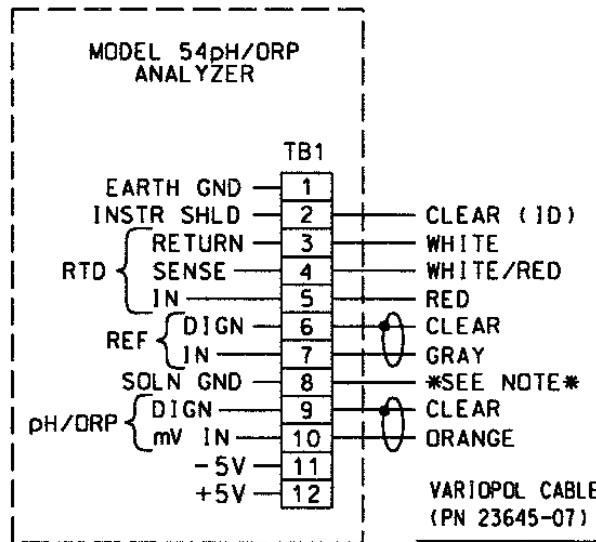


Figure 14. Wiring 54 through Remote Junction Box



NOTE: FOR 396PVP AND 396RVP, CONNECT BLUE WIRE TO TB1-8. FOR ALL OTHER VARIOPOL pH SENSORS, TERMINATE BLUE WIRE WITH WIRE NUT AND JUMPER TERMINALS 7 AND 8 TOGETHER.

Figure 15. Wiring for 54



* NOTE*: FOR 396PVP AND 396RVP, CONNECT BLUE WIRE TO TB1-8. FOR ALL OTHER VARIOPOL pH SENSORS, TERMINATE BLUE WIRE WITH WIRE NUT AND JUMPER TERMINALS 7 AND 8 TOGETHER.

Figure 16. Wiring Details of 396P-01-54 for use with and without Junction Box (PN 22719-02) for 1054, 1054A, 1054B, 2054, 2081, and Extension Cable (9200254).

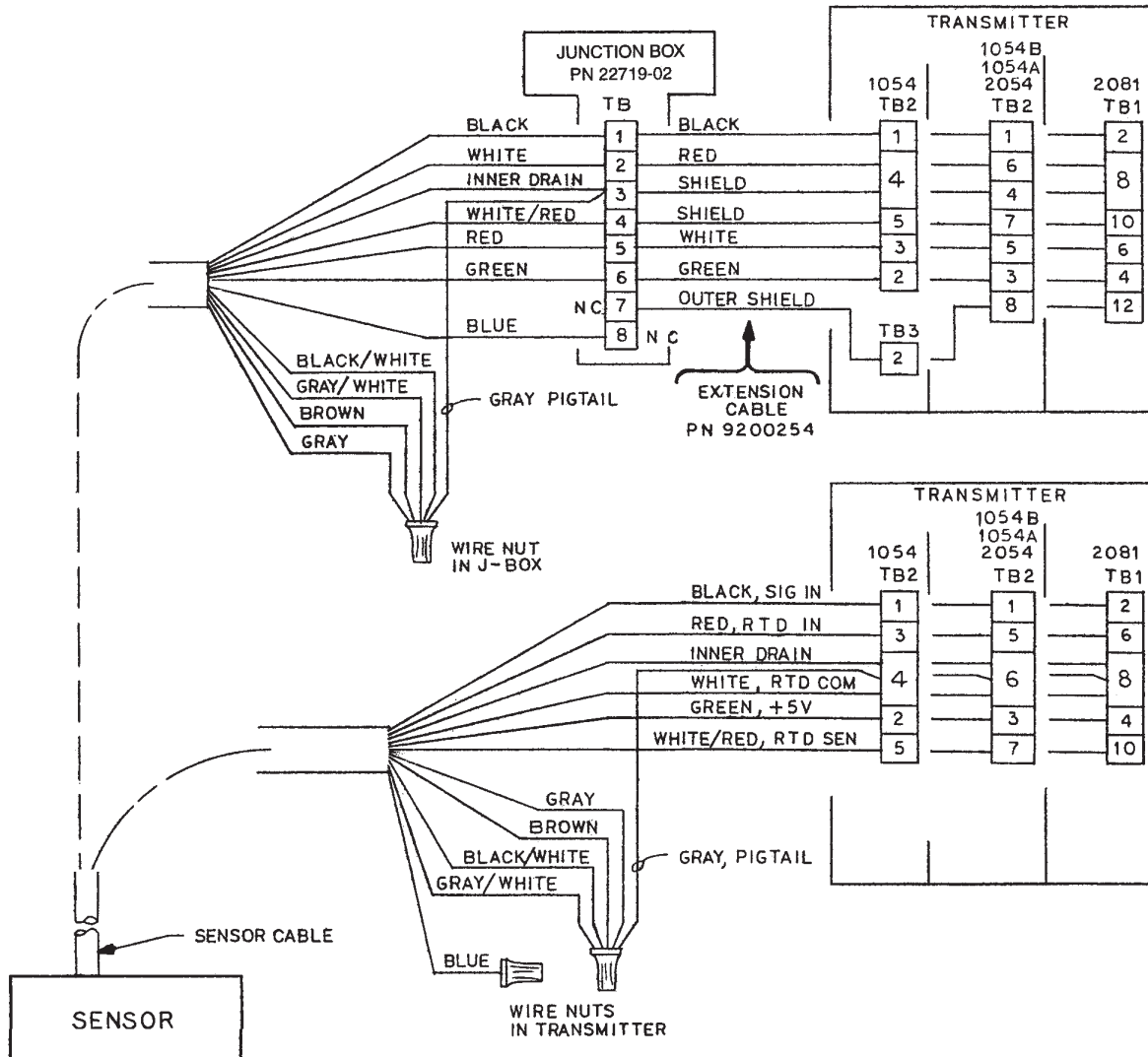


Figure 17. Wiring of 396P-01-55 for use with 54, 81, 3081, and 4081.

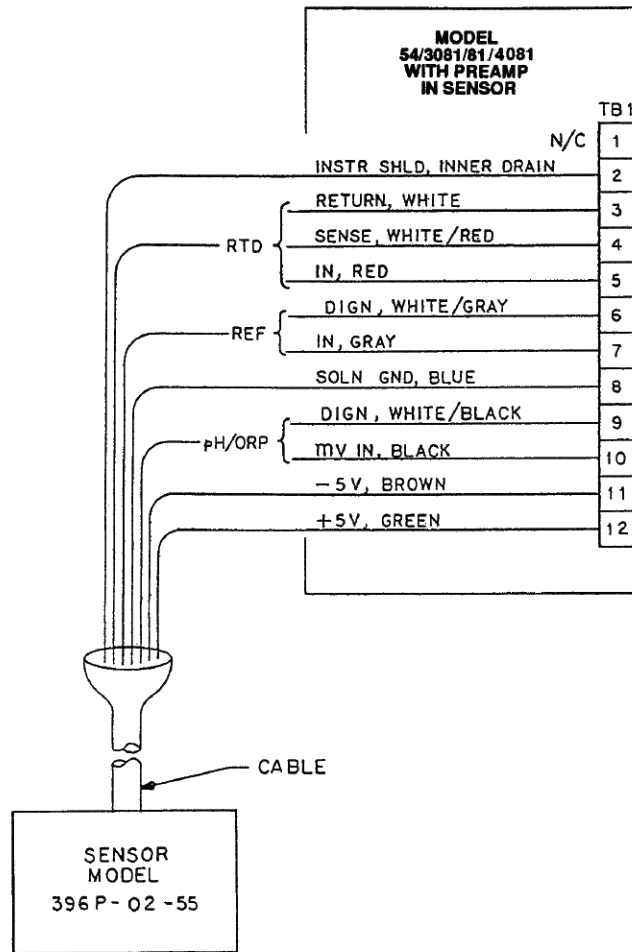


Figure 18. Junction Box (PN 23550-00) for 54, 3081, 4081, and 81.

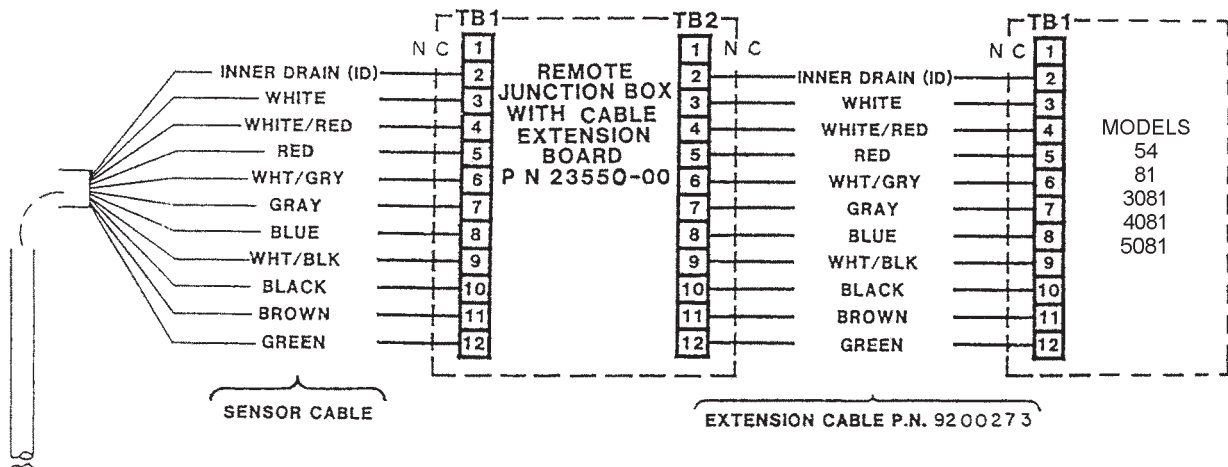
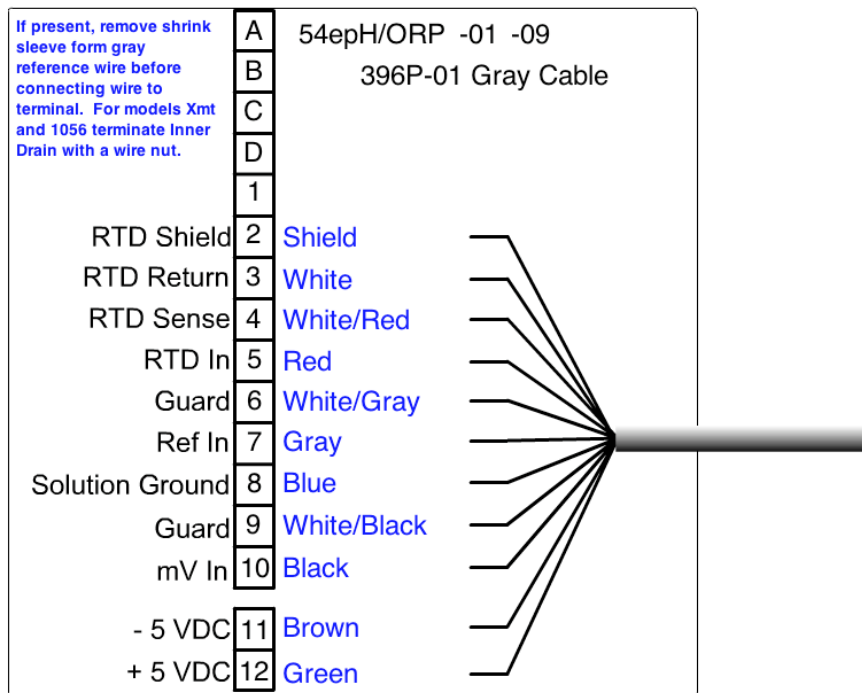
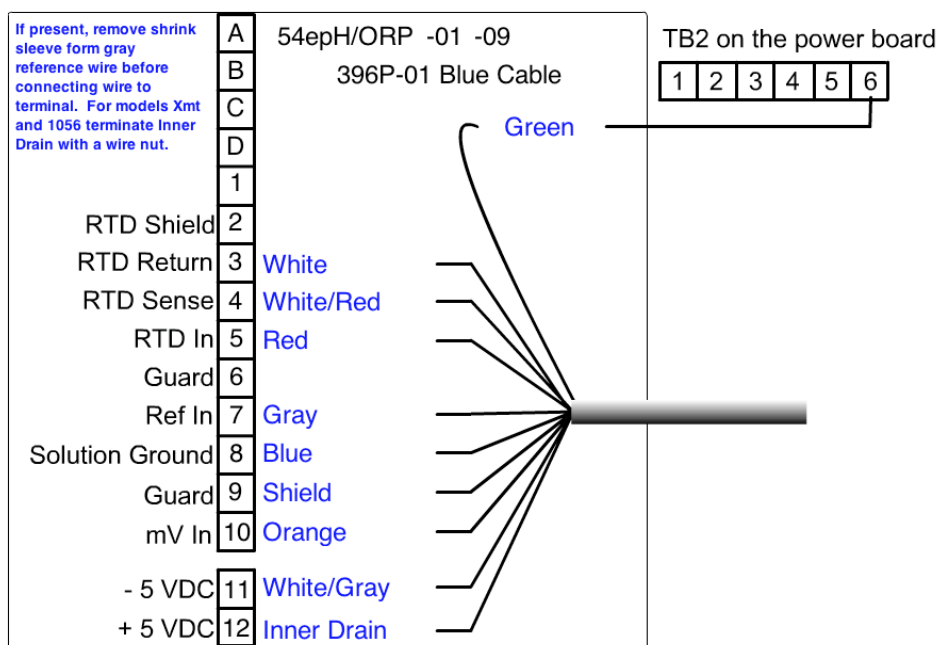


Figure 19. Wiring Details of 396P-01 Gray Cable for use with 54e pH/ORP-01-09



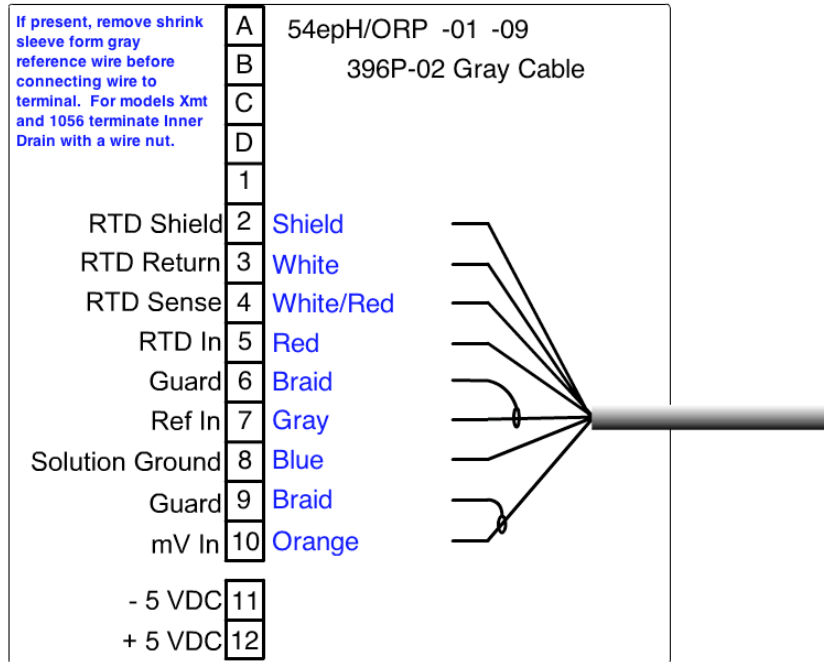
If present, reove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056, terminate Inner Drain with a wire nut.

Figure 20. Wiring Details of 396P-01 Blue Cable for use with 54e pH/ORP-01-09



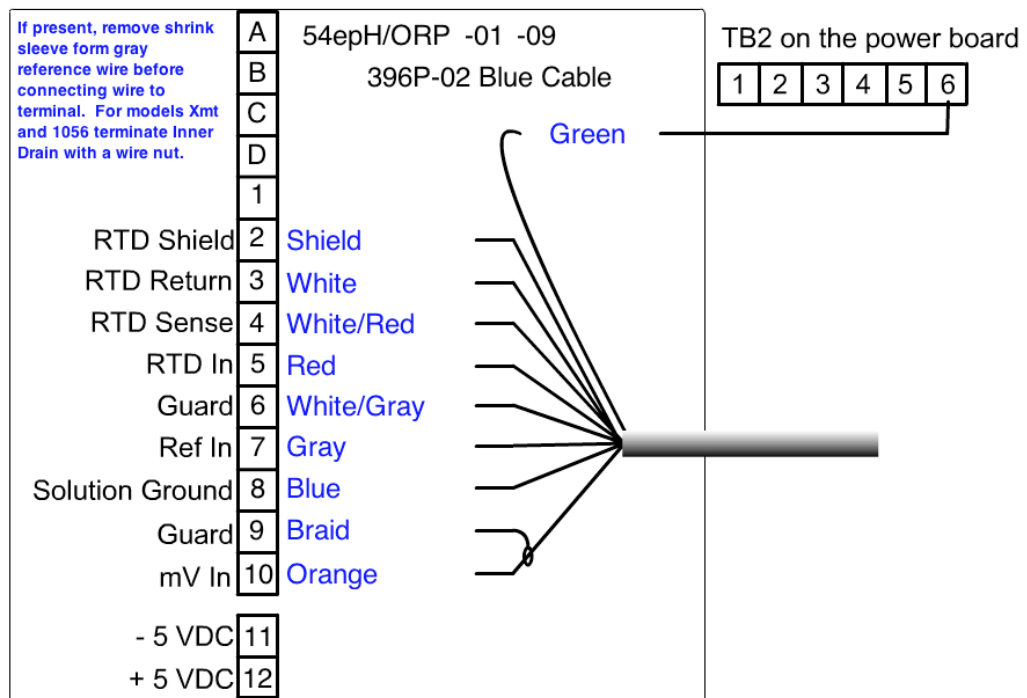
If present, reove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056, terminate Inner Drain with a wire nut.

Figure 21. Wiring Details of 396P-02 Gray Cable for use with 54e pH/ORP-01-09



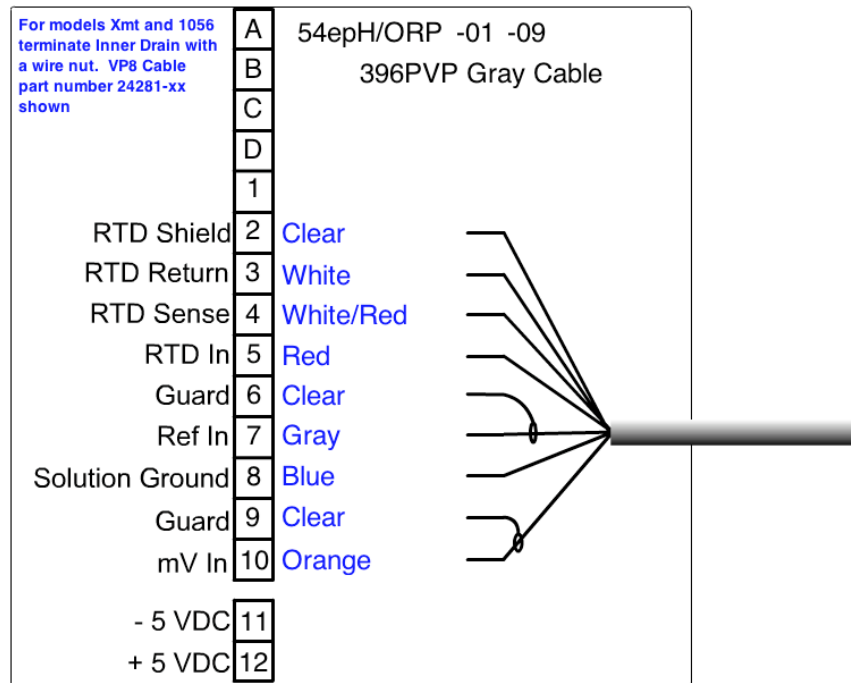
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056, terminate Inner Drain with a wire nut.

Figure 22. Wiring Details of 396P-02 Blue Cable for use with 54e pH/ORP-01-09



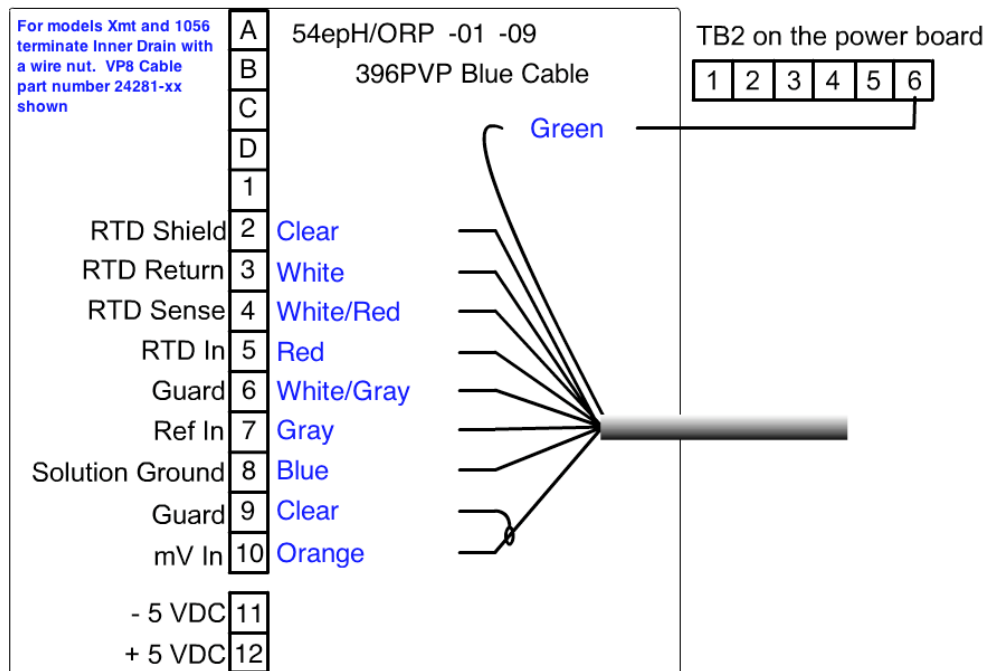
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056, terminate Inner Drain with a wire nut.

Figure 23. Wiring Details of 396PVP Gray Cable for use with 54e pH/ORP-01-09



For XMT and 1056 terminate Inner Drain with a wire nut. VP8 Cable part number 24281-xx shown.

Figure 24. Wiring Details of 396PVP Blue Cable for use with 54e pH/ORP-01-09



For XMT and 1056 terminate Inner Drain with a wire nut. VP8 Cable part number 24281-xx shown.

Figure 25. Wiring Details of 396P-01 for use with 1055-01-10-22

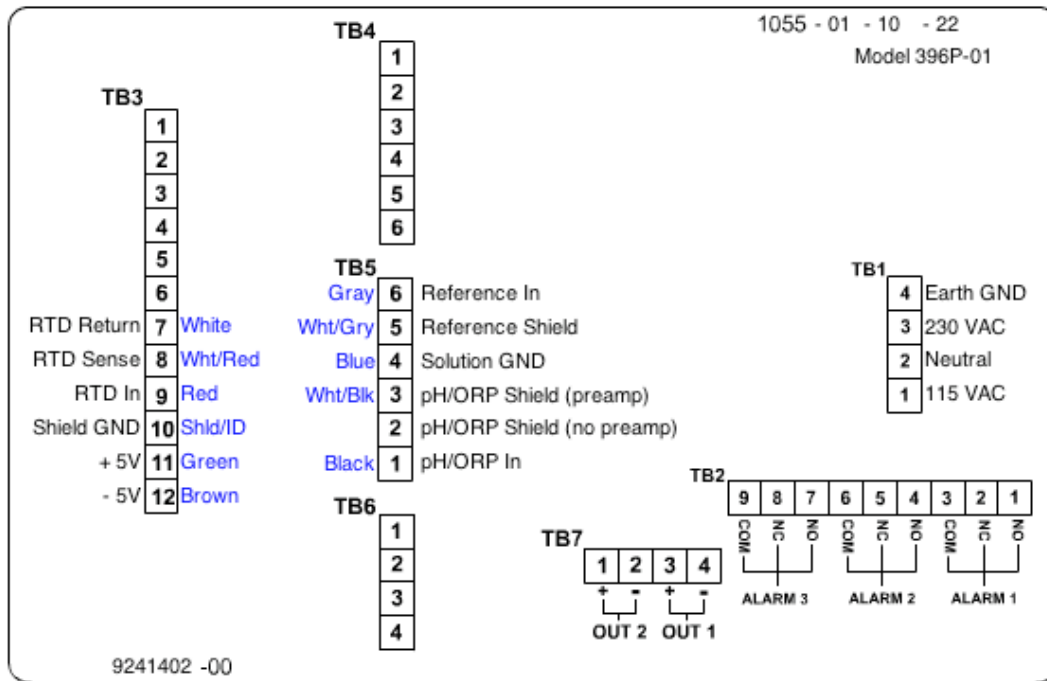


Figure 26. Wiring Details of 396P-01 for use with 1055-01-10-22-32

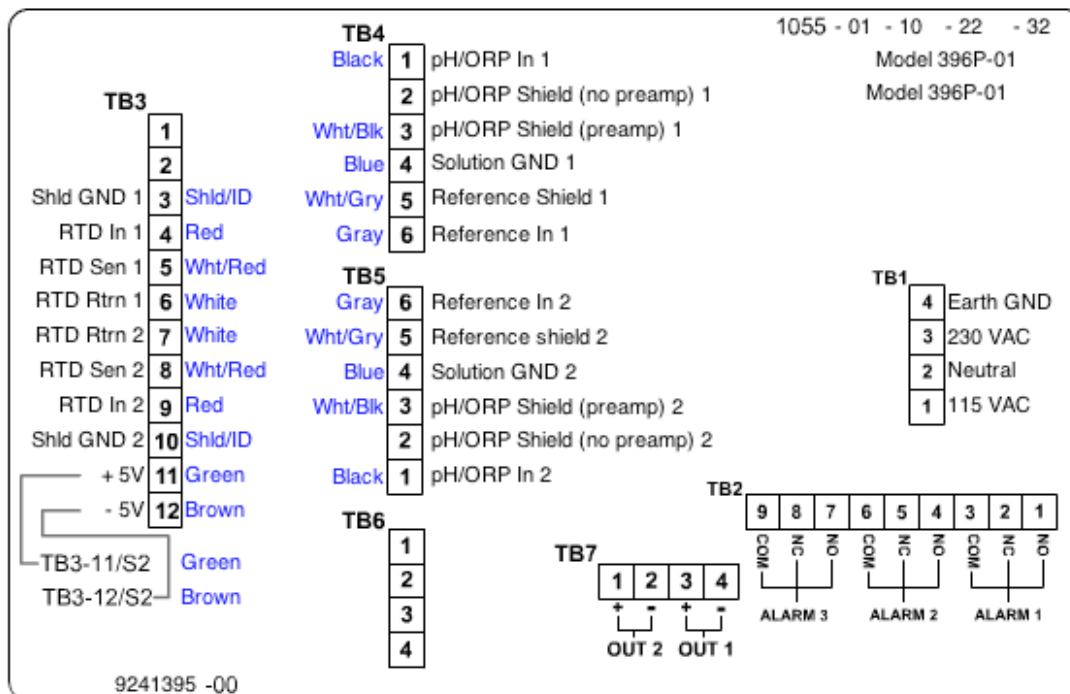


Figure 27. Wiring Details of 396P-02 for use with 1055-01-10-22-32

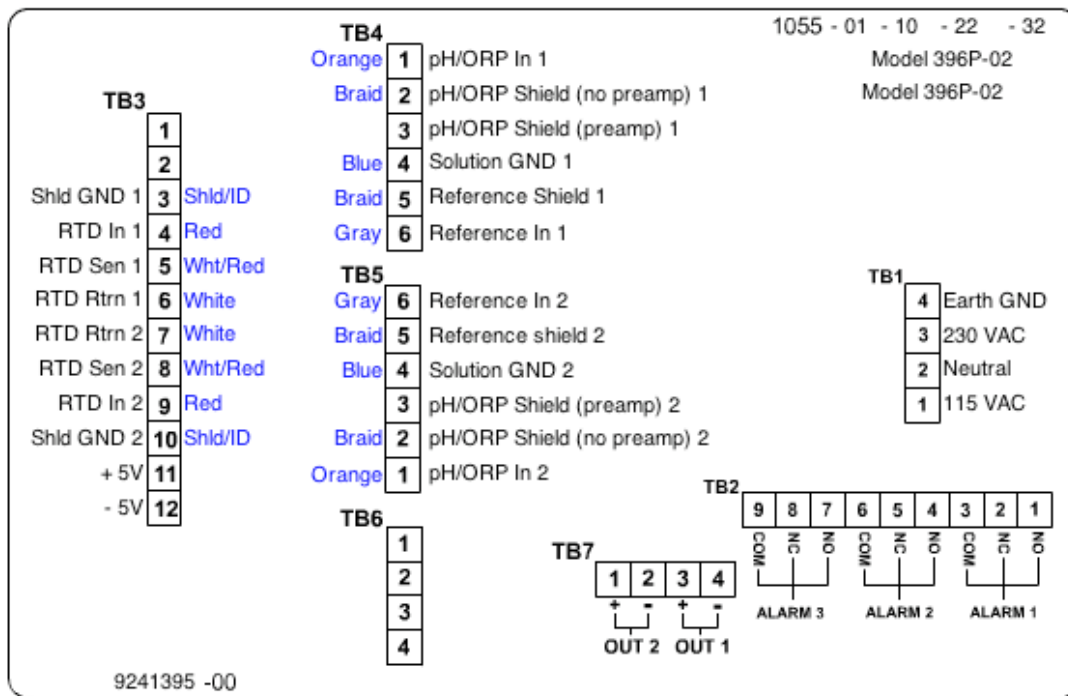


Figure 28. Wiring Details of 396PVP for use with 1055-01-10-22-32

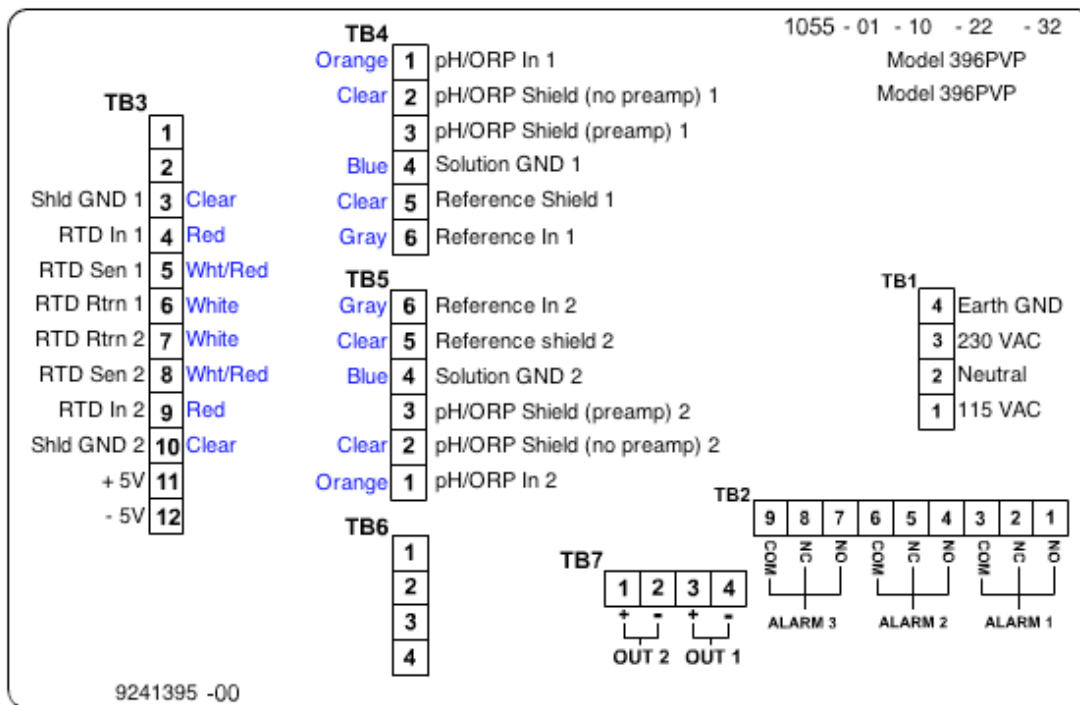
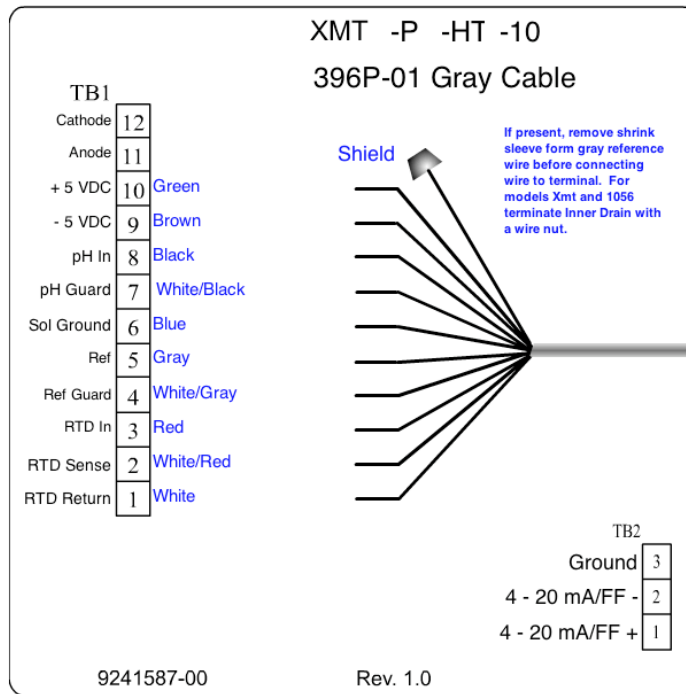
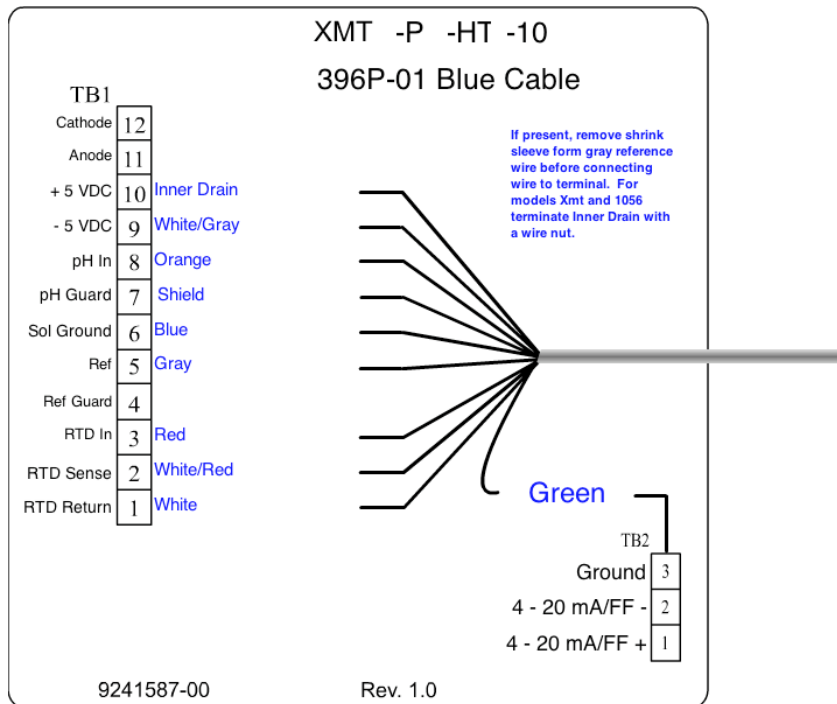


Figure 29. Wiring Details of 396P-01 Gray Cable for use with XMT-P-HT-10



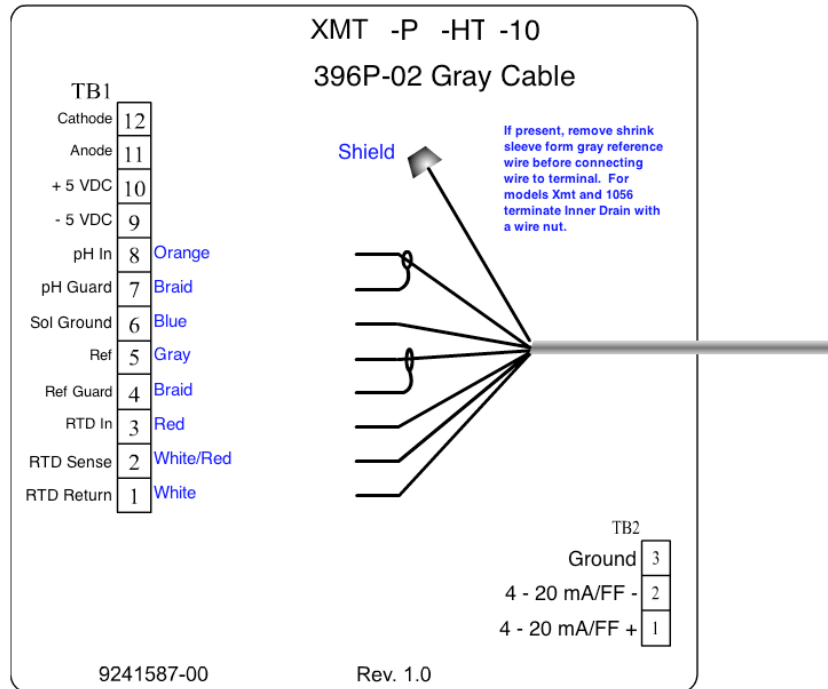
**If present, remove shrink sleeve from gray reference wire before connecting wire to terminal.
For XMT and 1056 terminate Inner Drain with a wire nut.**

Figure 30. Wiring Details of 396P-01 Blue Cable for use with XMT-P-HT-10



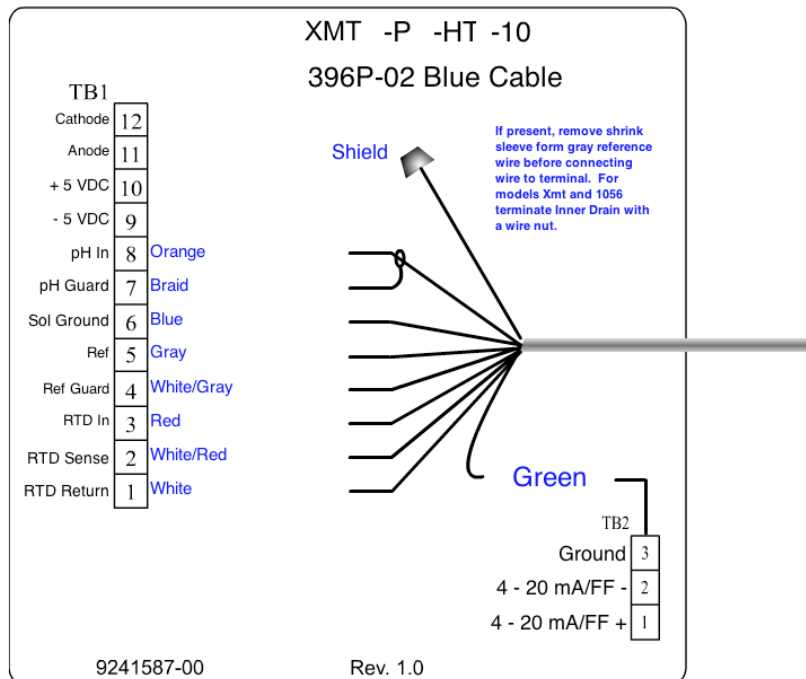
**If present, remove shrink sleeve from gray reference wire before connecting wire to terminal.
For XMT and 1056 terminate Inner Drain with a wire nut.**

Figure 31. Wiring Details of 396P-02 Gray Cable for use with XMT-P-HT-10



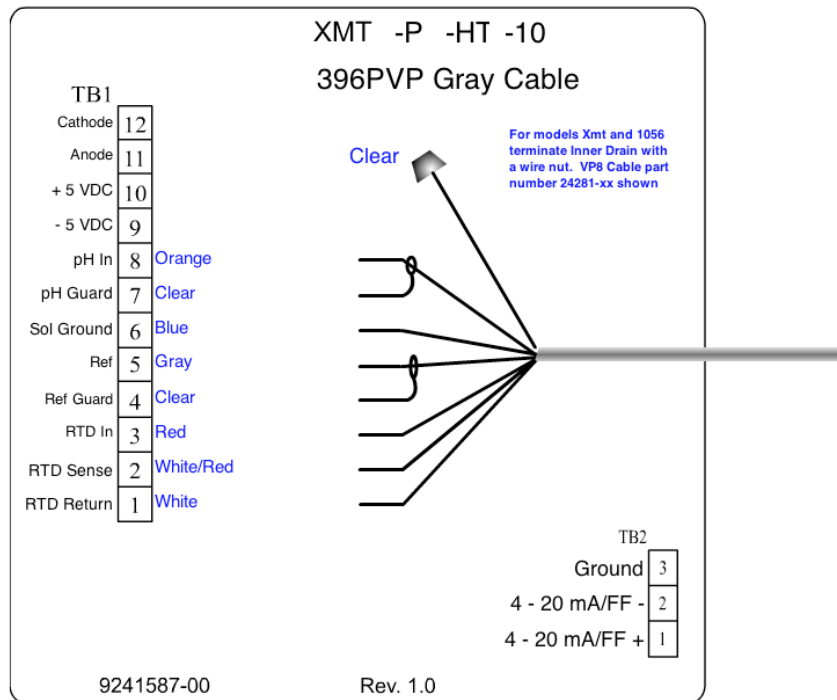
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 32. Wiring Details of 396P-02 Blue Cable for use with XMT-P-HT-10



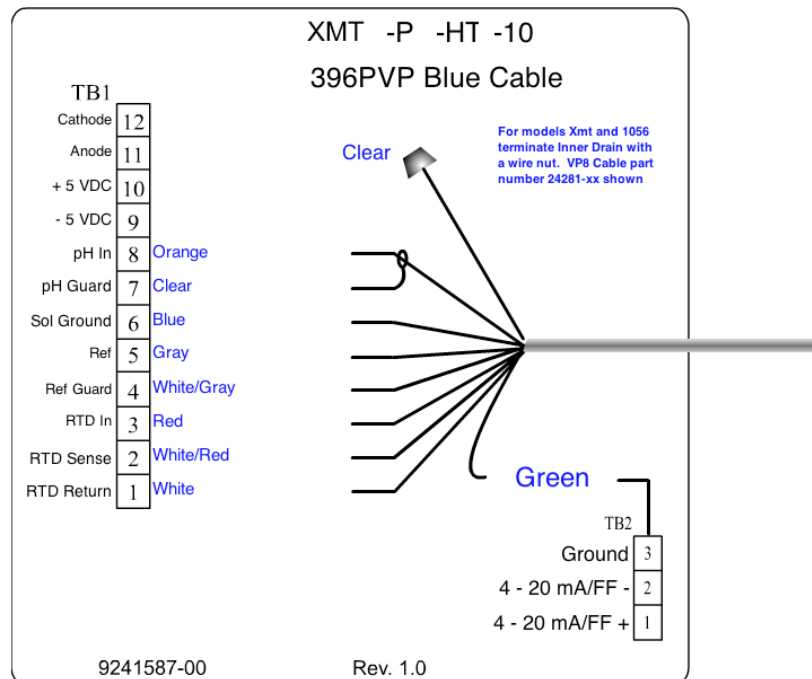
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 33. Wiring Details of 396PVP Gray Cable for use with XMT-P-HT-10



If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 34. Wiring Details of 396PVP Blue Cable for use with XMT-P-HT-10



If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 35. Wiring through j-box for 1056

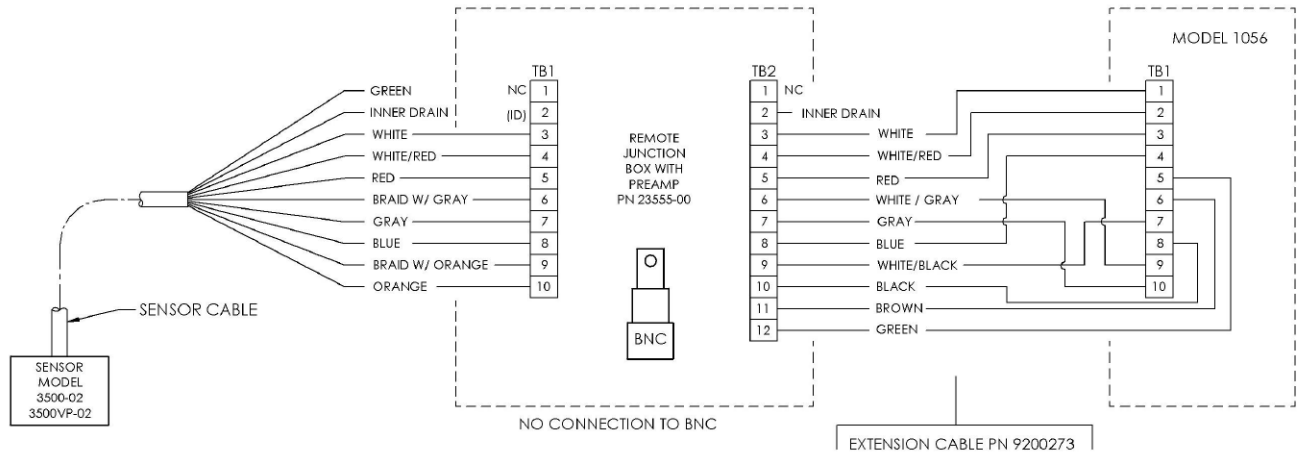
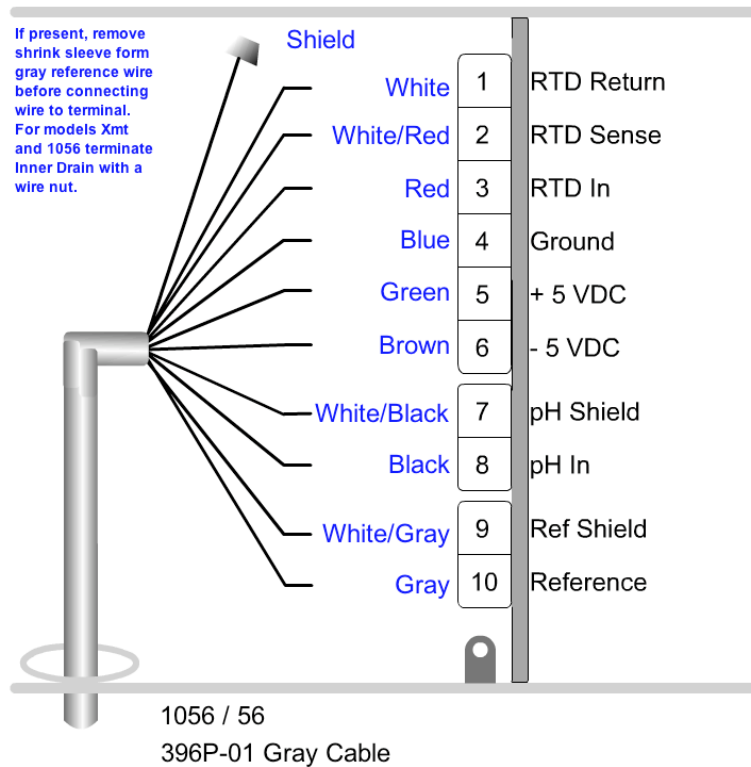
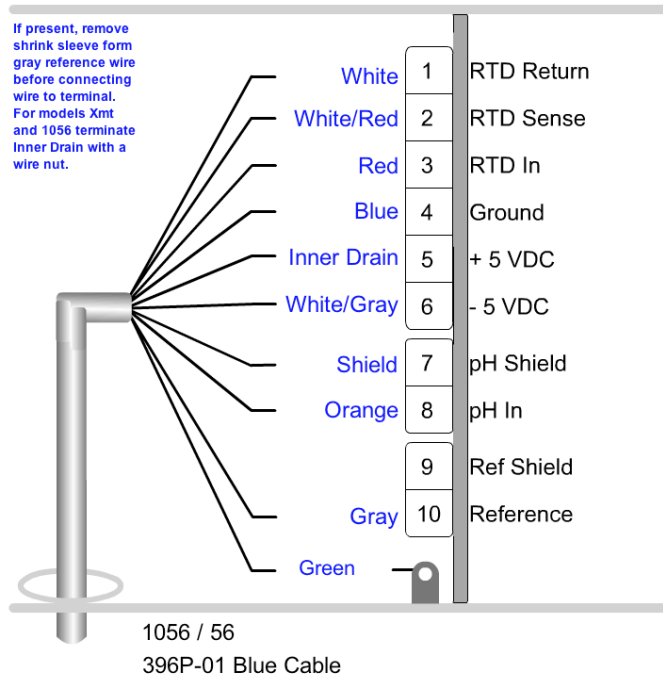


Figure 36. Wiring Details of 396P-01 Gray Cable for 1056/56



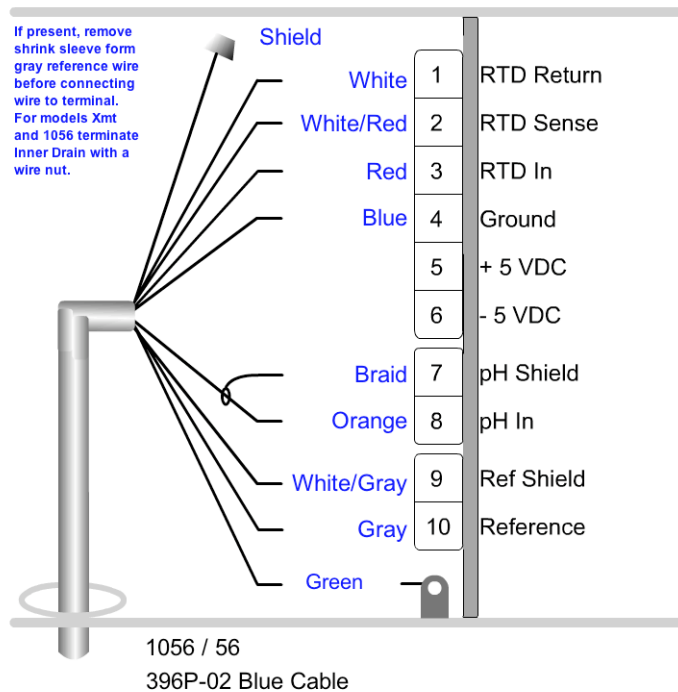
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 37. Wiring Details of 396P-01 Blue Cable for 1056/56



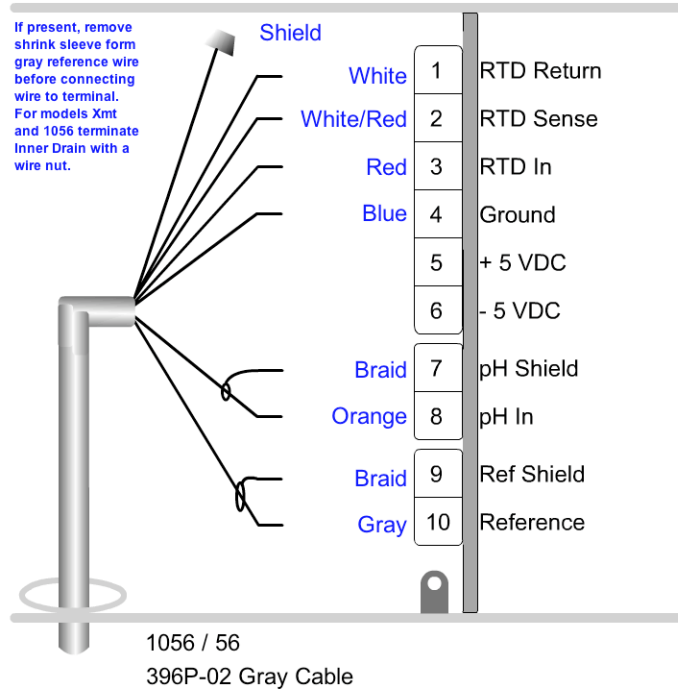
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 38. Wiring Details of 396P-02 Blue Cable for 1056/56



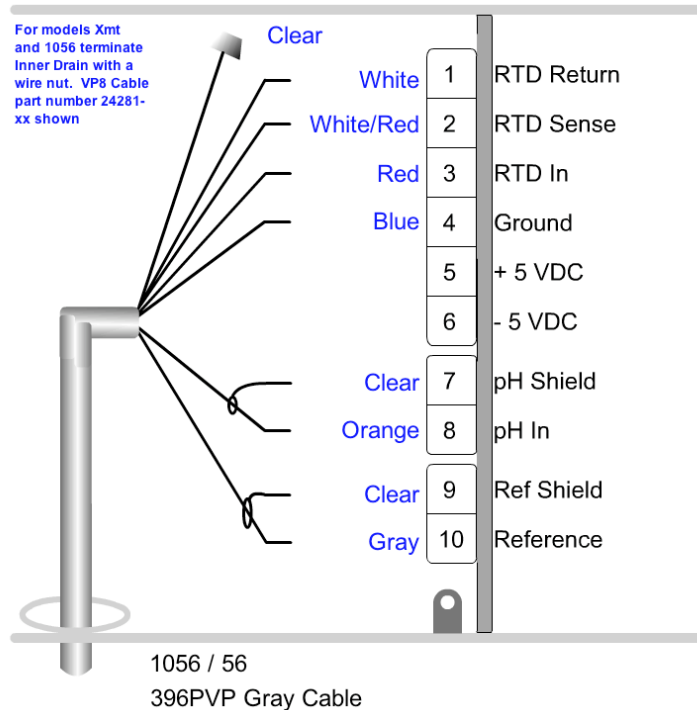
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 39. Wiring Details of 396P-02 Gray Cable for 1056/56



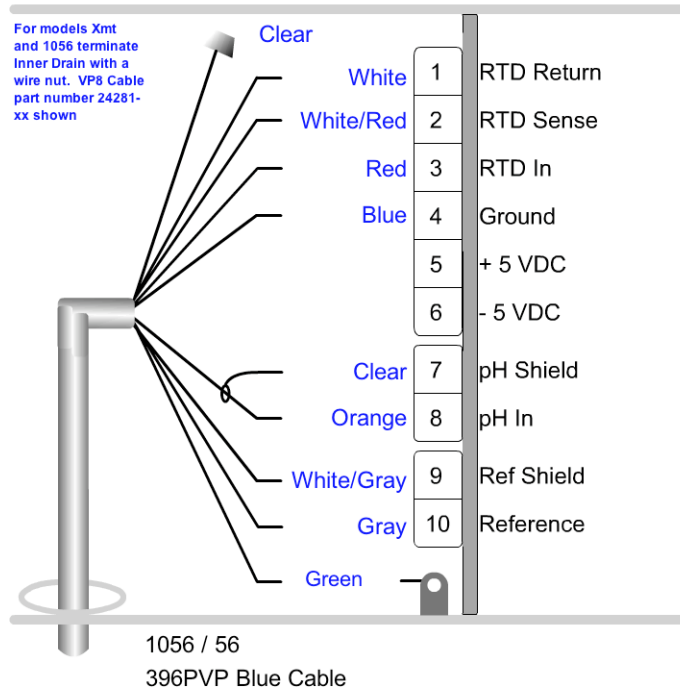
If present, remove shrink sleeve from gray reference wire before connecting wire to terminal. For XMT and 1056 terminate Inner Drain with a wire nut.

Figure 40. Wiring Details of 396PVP Gray Cable for 1056/56



For XMT and 1056 terminate inner Drain with a wire nut. VP8 Cable part number 24281-xx shown

Figure 41. Wiring Details of 396PVP Blue Cable for 1056/56



For XMT and 1056 terminate inner Drain with a wire nut. VP8 Cable part number 24281-xx shown

Figure 42. pH/ORP Sensor Wiring for 1056/1057/56/396VP-70 (Blue Cable)

pH / ORP SENSOR WIRING -1056/1057/56/396VP-70 (Blue Cable)
(Refer to manual for recommended order)

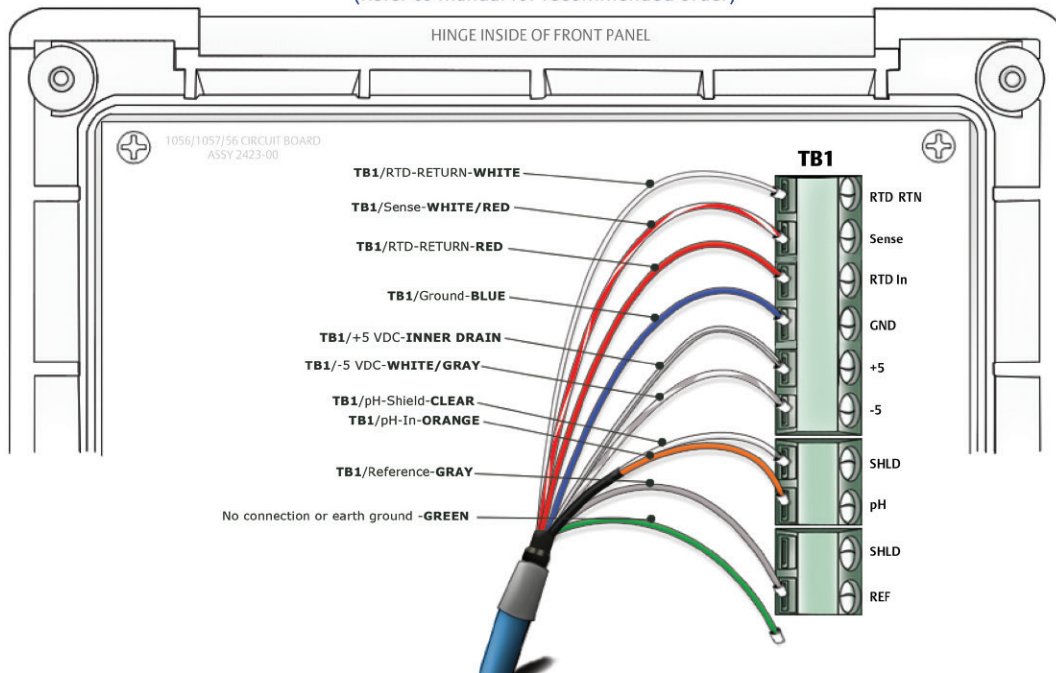


Figure 43. Wiring Details of 396P-01 Gray Cable for 1057

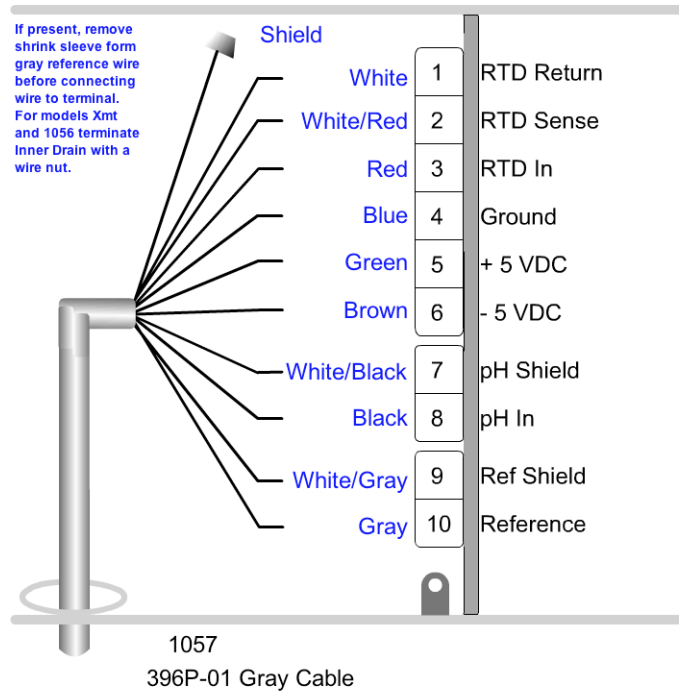


Figure 44. Wiring Details of 396P-01 Blue Cable for 1057

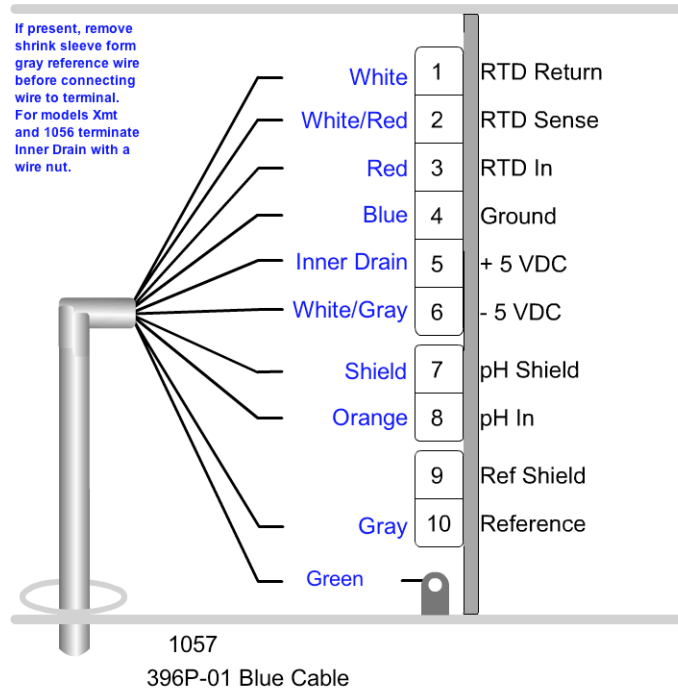


Figure 45. Wiring Details of 396P-02 Gray Cable for 1057

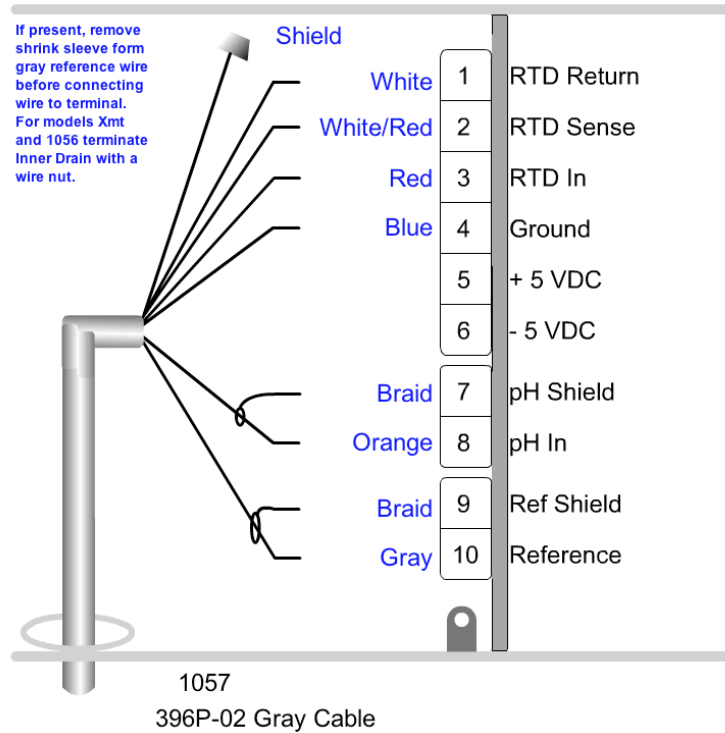


Figure 46. Wiring Details of 396P-02 Blue Cable for 1057

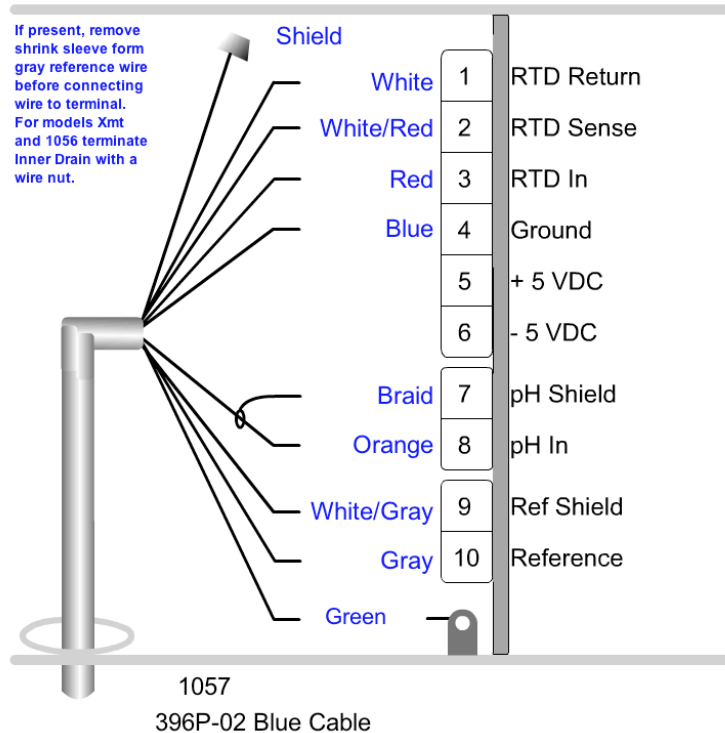


Figure 47. Wiring Details of 396PVP Gray Cable for 1057

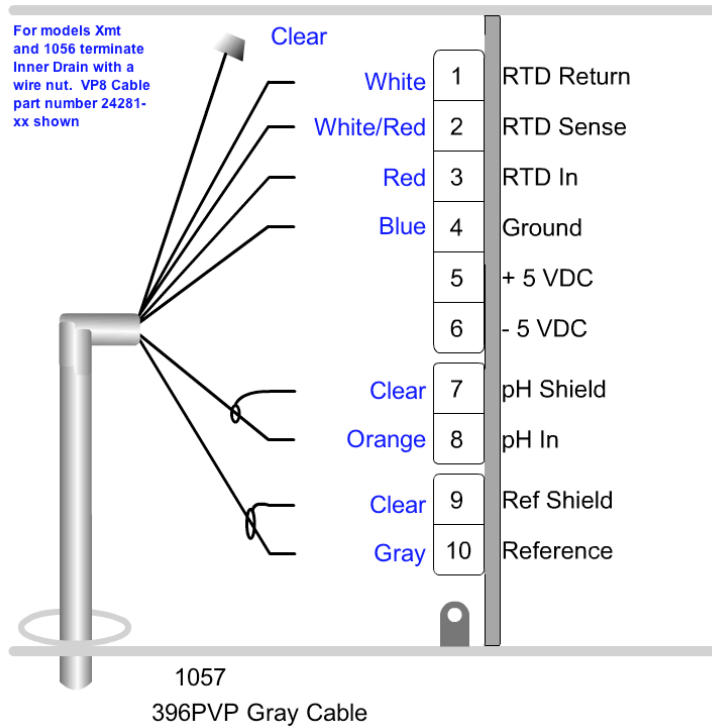


Figure 48. Wiring Details of 396PVP Blue Cable for 1057

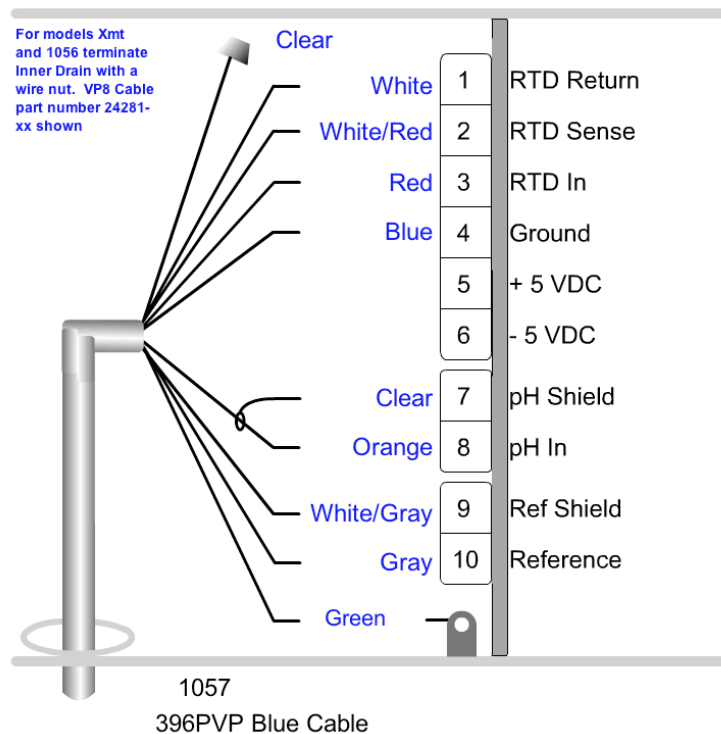


Figure 49. pH/ORP Sensor Wiring for 1066/396P-01 (Gray Cable)

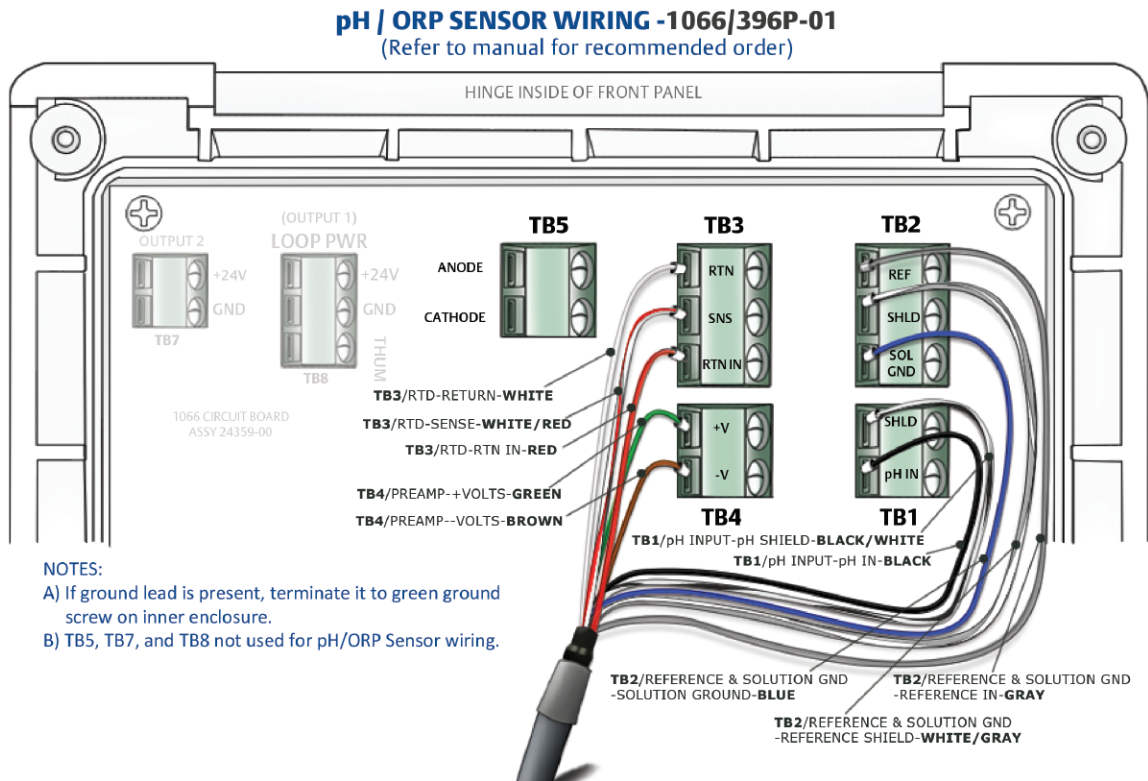


Figure 50. pH/ORP Sensor Wiring for 1066/396P-01 (Blue Cable)

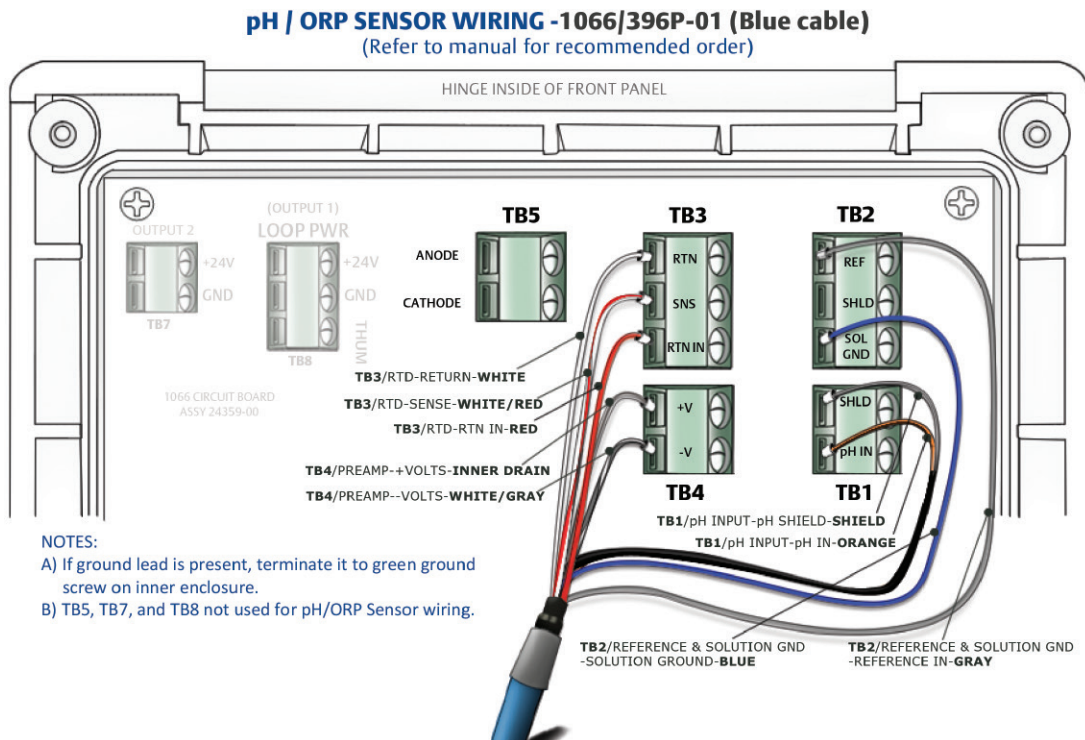


Figure 51. pH/ORP Sensor Wiring for 1066/396P-02 (Gray Cable)

pH / ORP SENSOR WIRING - 1066/396P-02
(Refer to manual for recommended order)

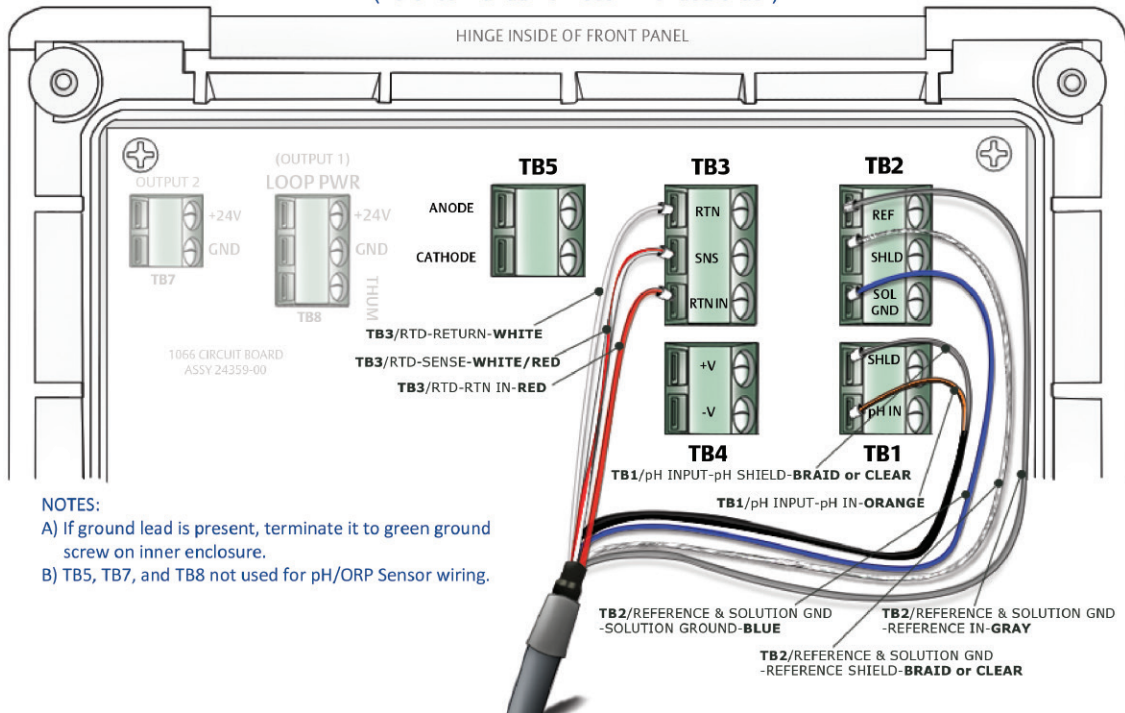


Figure 52. pH/ORP Sensor Wiring for 1066/396P-02 (Blue Cable)

pH / ORP SENSOR WIRING - 1066/396P-02 (Blue cable)
(Refer to manual for recommended order)

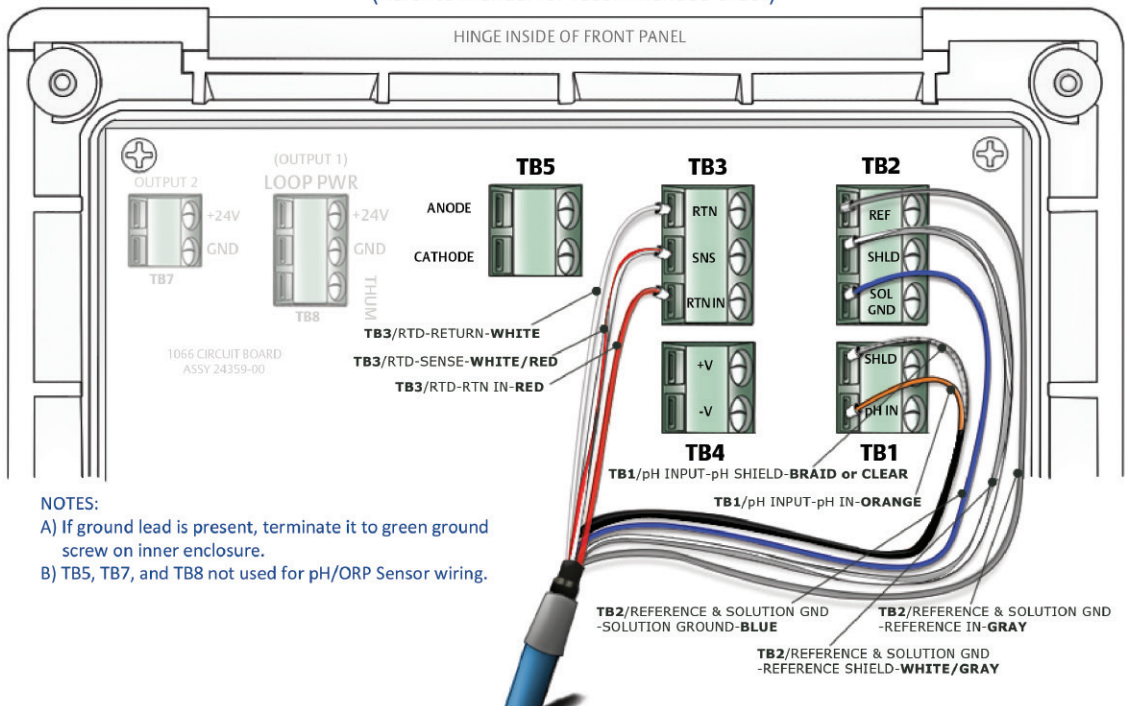


Figure 53. pH/ORP Sensor Wiring for 1066/396PVP (Gray Cable)

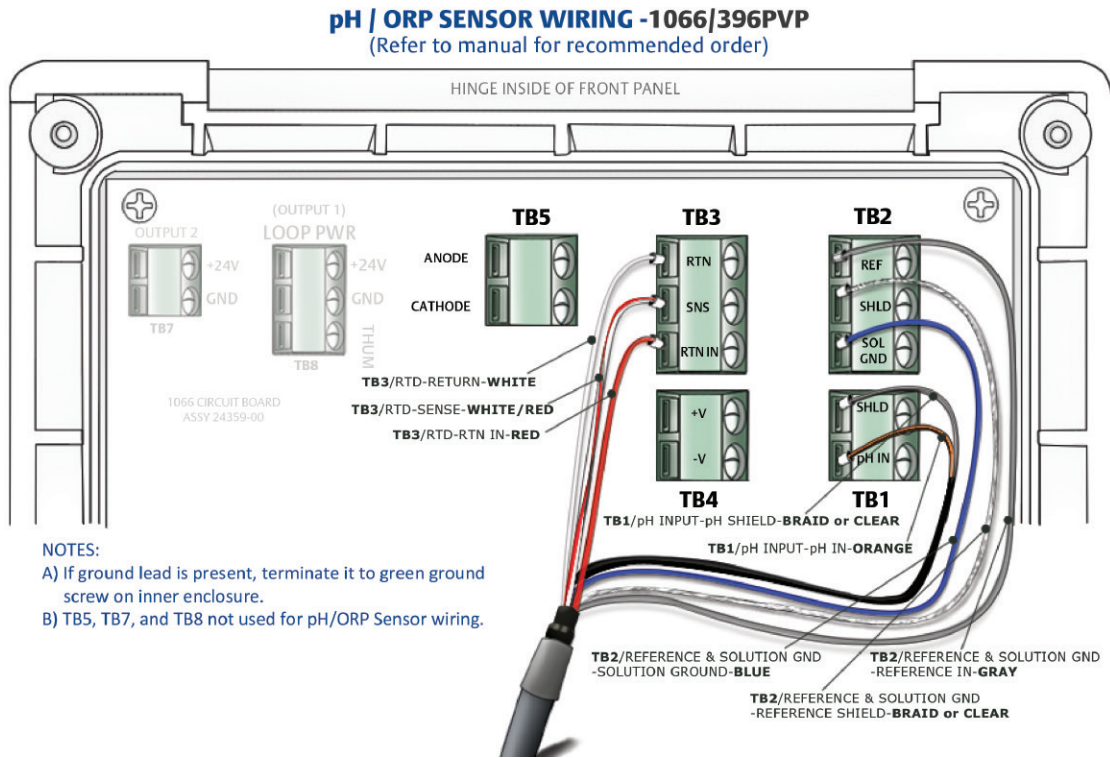


Figure 54. pH/ORP Sensor Wiring for 1066/396PVP (Blue Cable)

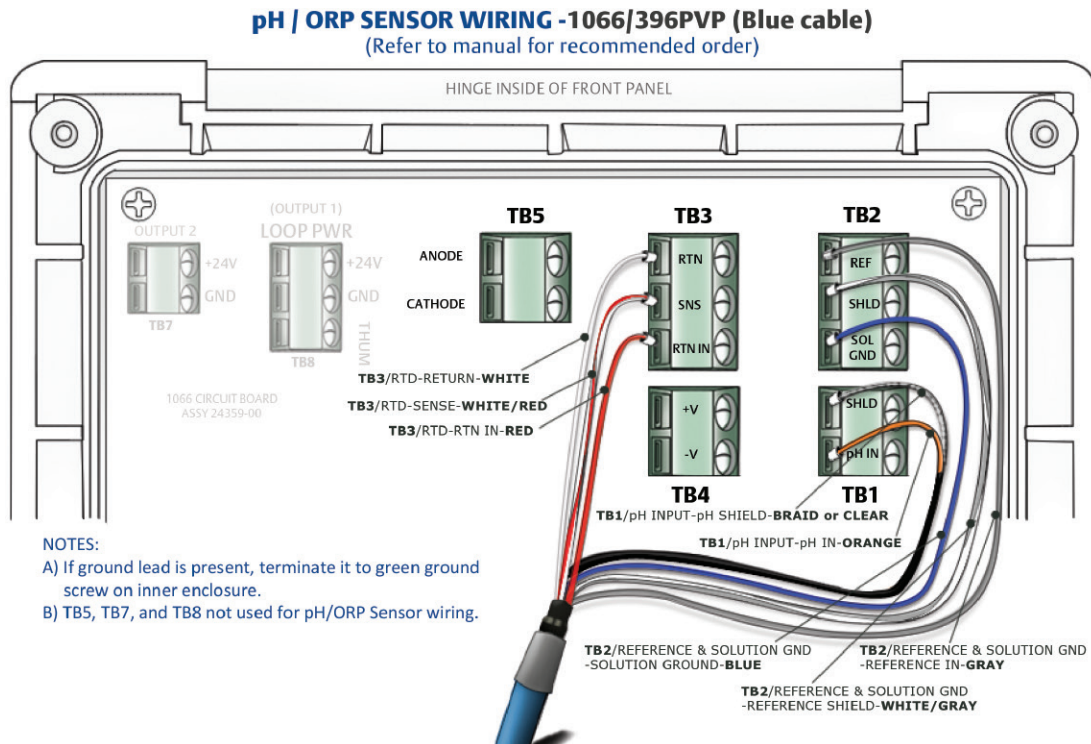


Figure 55. pH/ORP Sensor Wiring for 1066/396PVP-70 (Blue Cable)

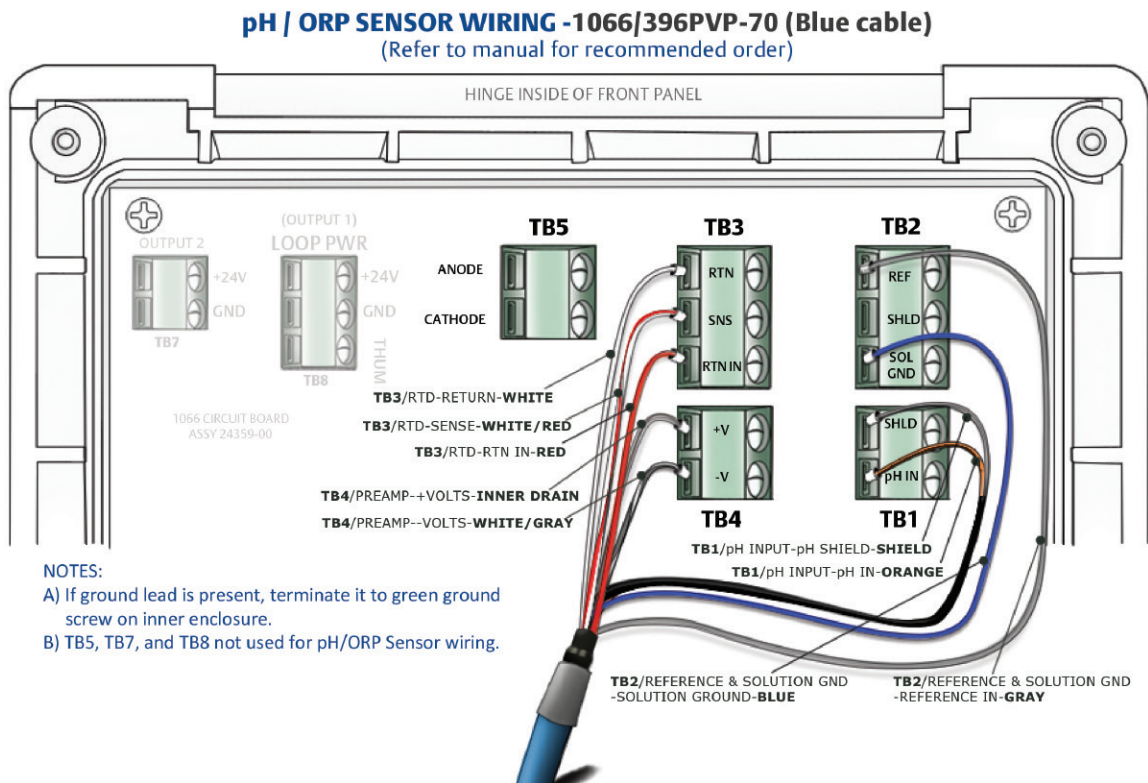


Figure 56. Wiring Details of 396P-01 Gray Cable for 5081-P-HT

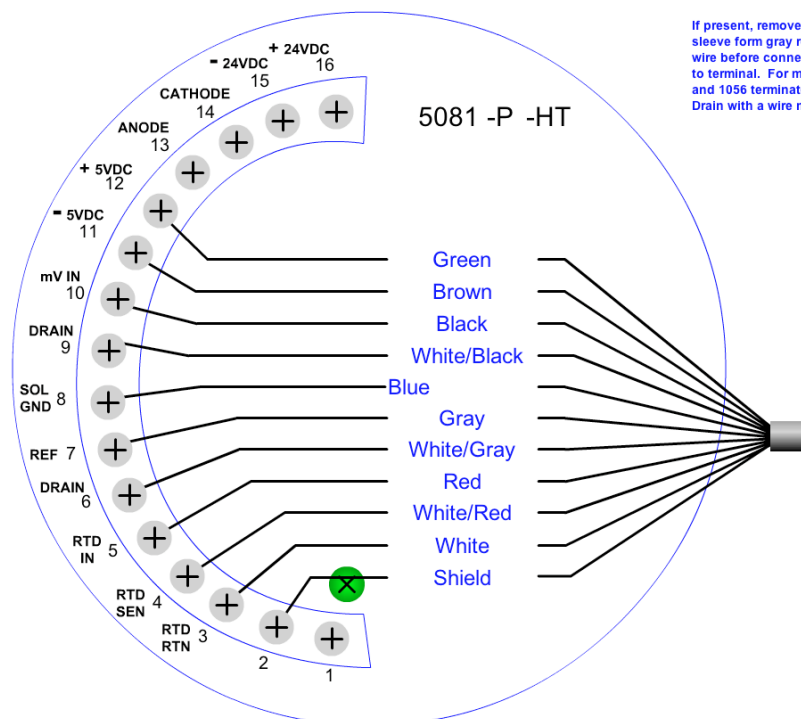


Figure 57. Wiring Details of 396P-01 Blue Cable for 5081-P-HT

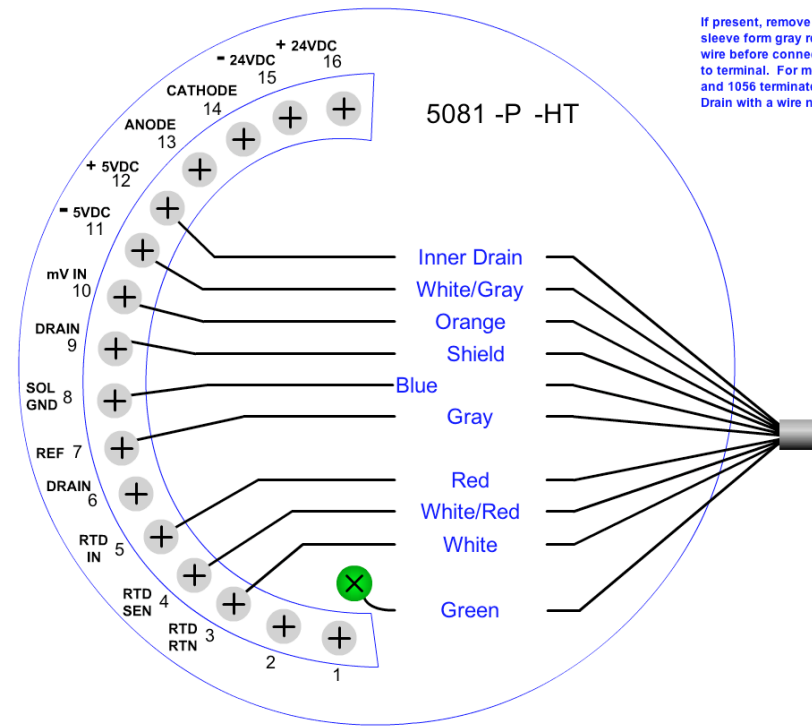


Figure 58. Wiring Details of 396P-02 Gray Cable for 5081-P-HT

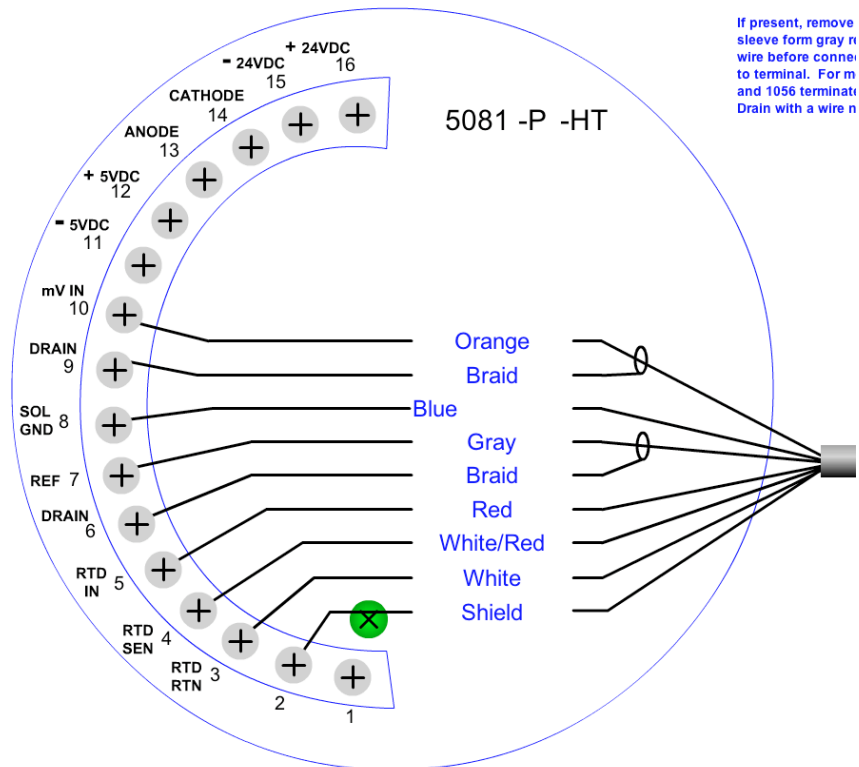


Figure 59. Wiring Details of 396P-02 Blue Cable for 5081-P-HT

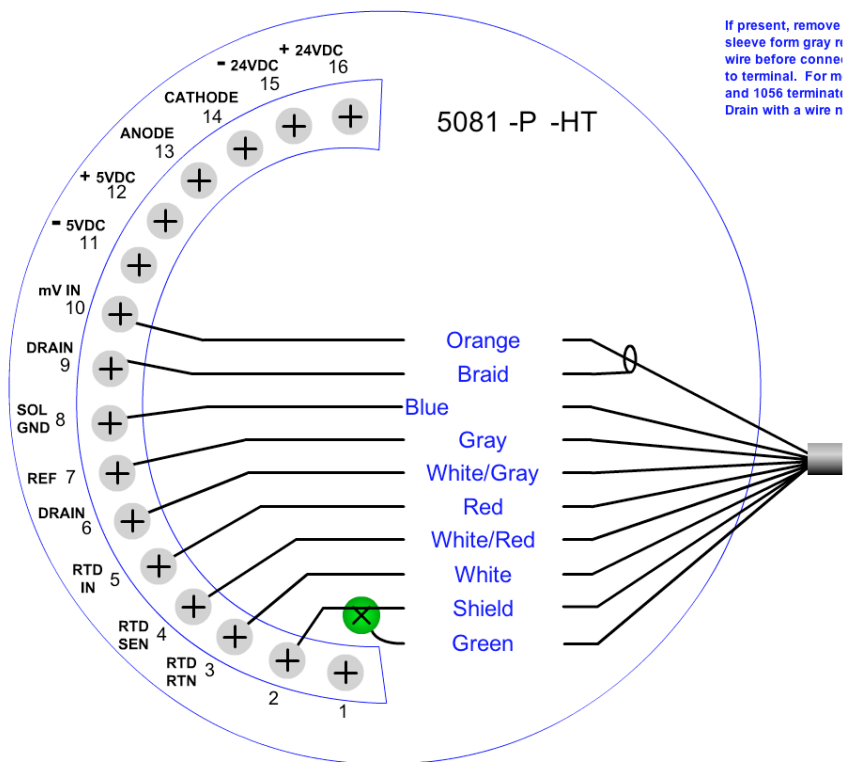


Figure 60. Wiring Details of 396PVP Gray Cable for 5081-P-HT

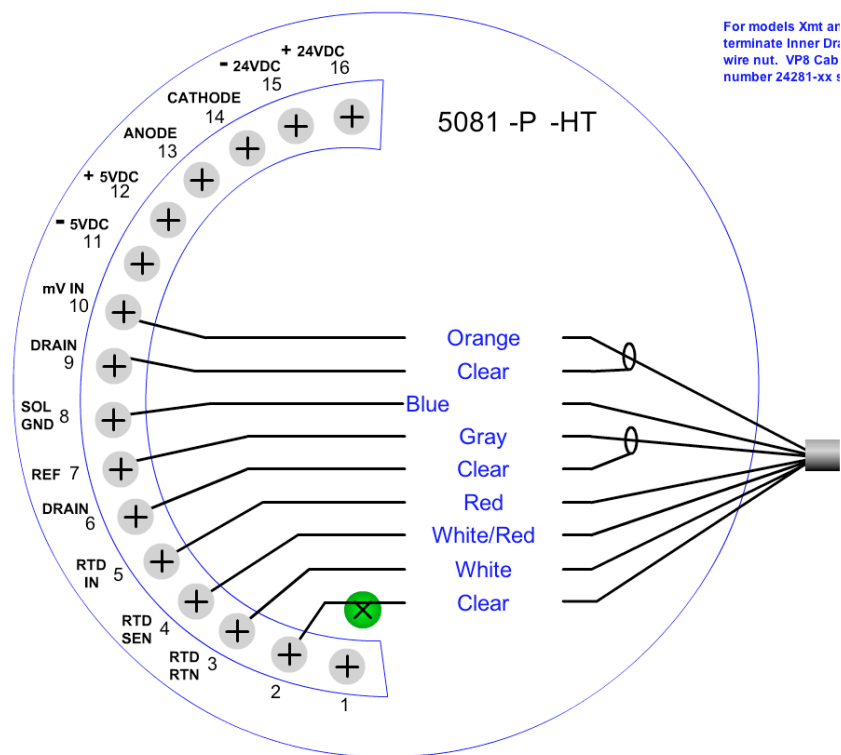


Figure 61. Wiring Details of 396PVP Blue Cable for 5081-P-HT

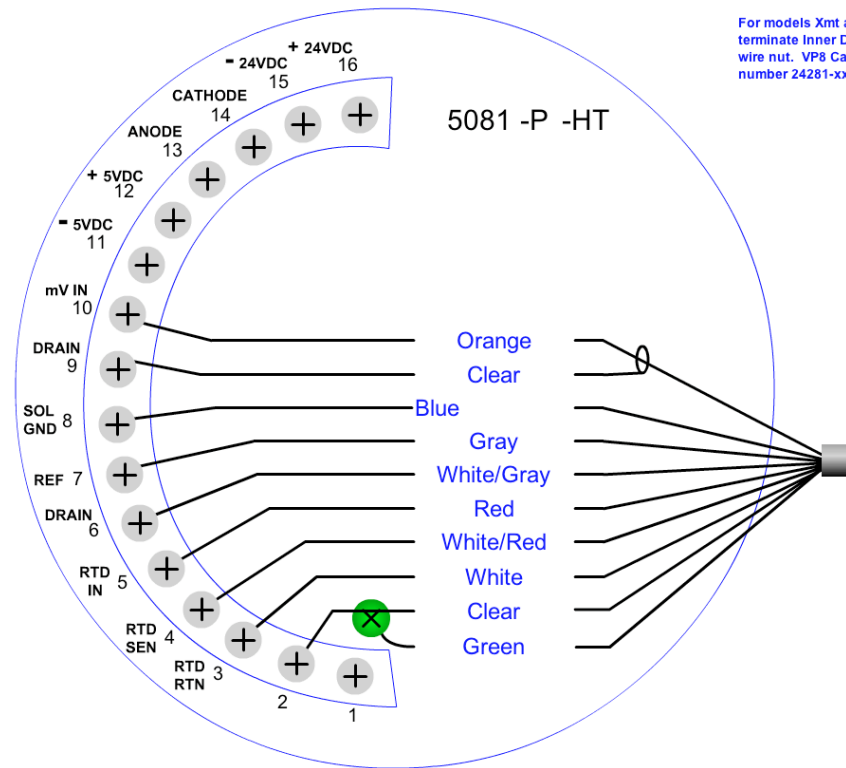


Figure 62. pH/ORP Sensor Wiring for 5081/398RVP-70 (Blue Cable)

pH / ORP SENSOR WIRING -5081/398RVP-70 (Blue cable)
(Refer to manual for recommended order)

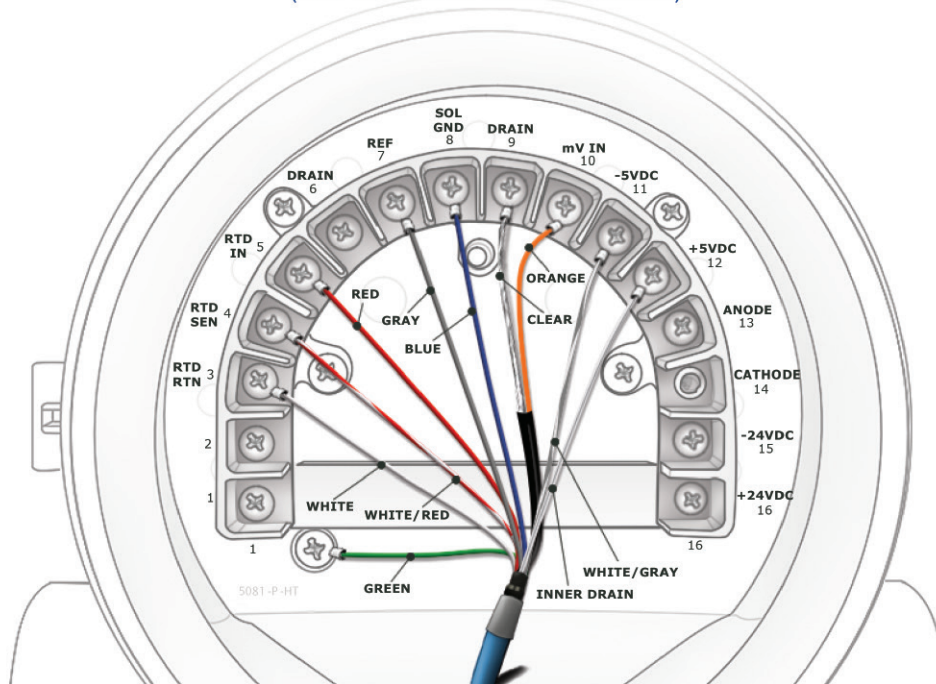


Figure 63. Wiring Details of 396P-01 Gray Cable for use with 6081

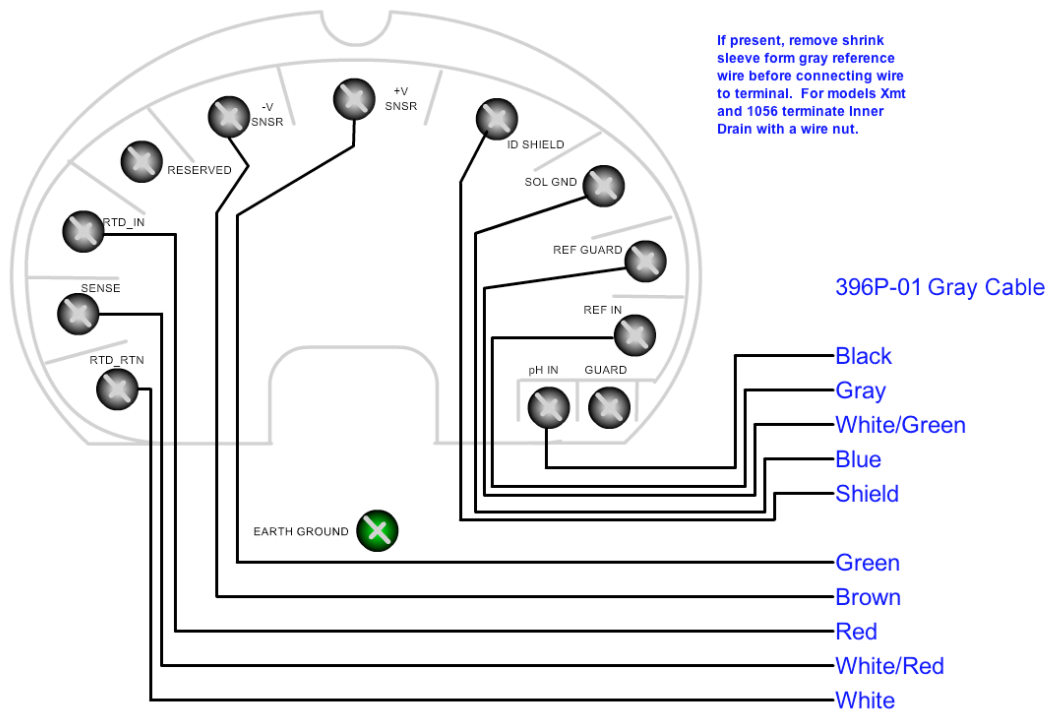


Figure 64. Wiring Details of 396P-01 Blue Cable for use with 6081

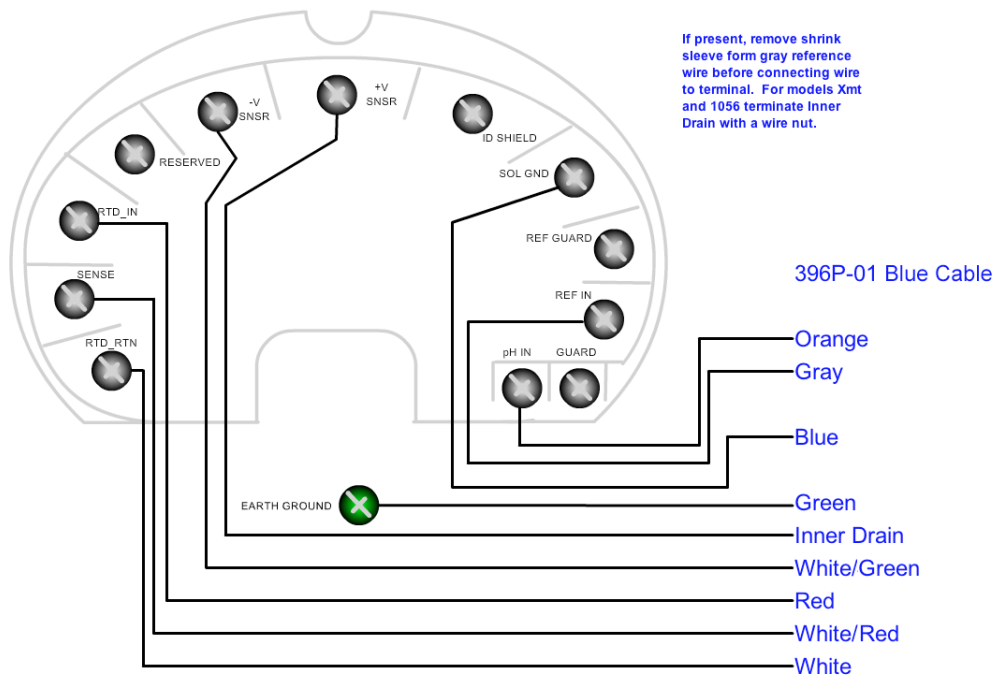


Figure 65. Wiring Details of 396P-02 Gray Cable for use with 6081

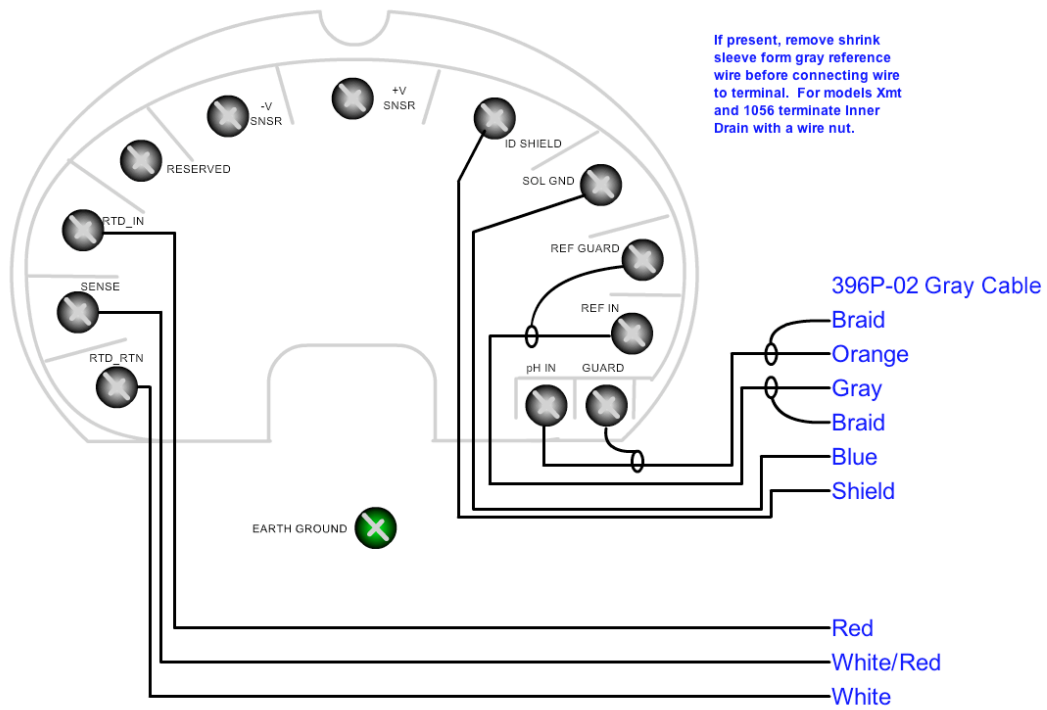


Figure 66. Wiring Details of 396P-02 Blue Cable for use with 6081

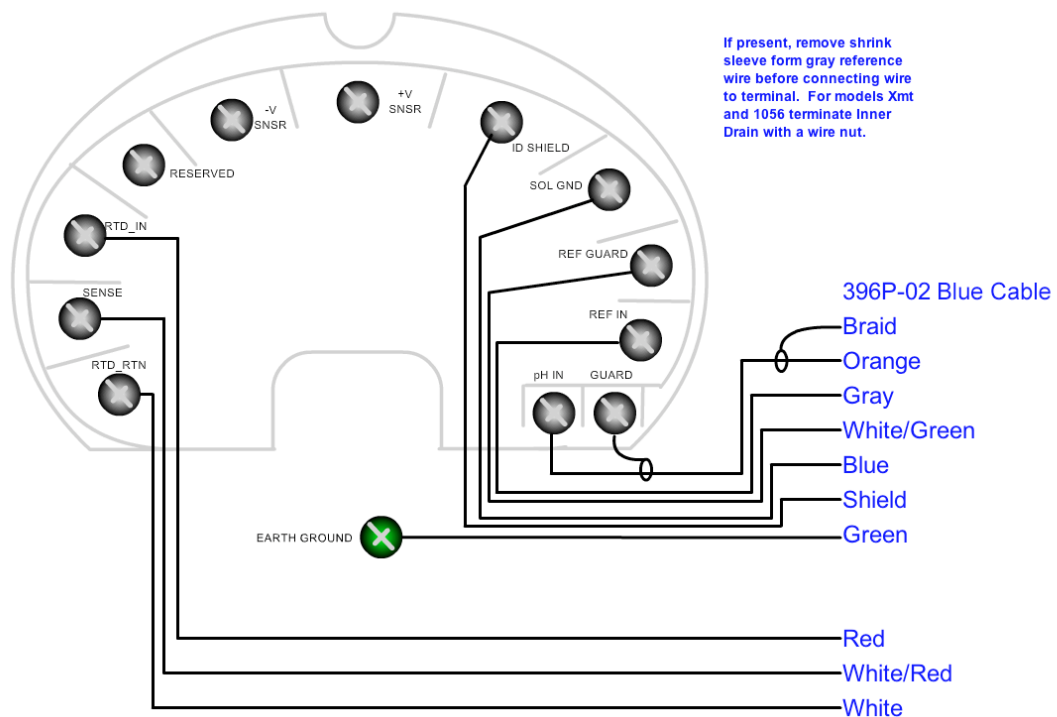


Figure 67. Wiring Details of 396PVP Gray Cable for use with 6081

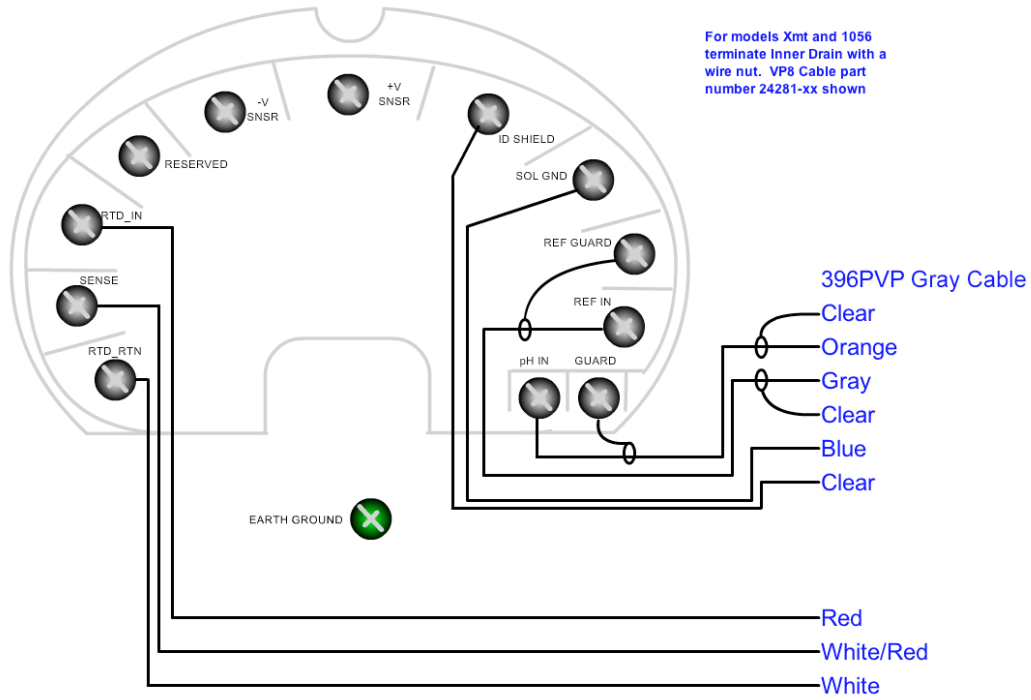


Figure 68. Wiring Details of 396PVP Blue Cable for use with 6081

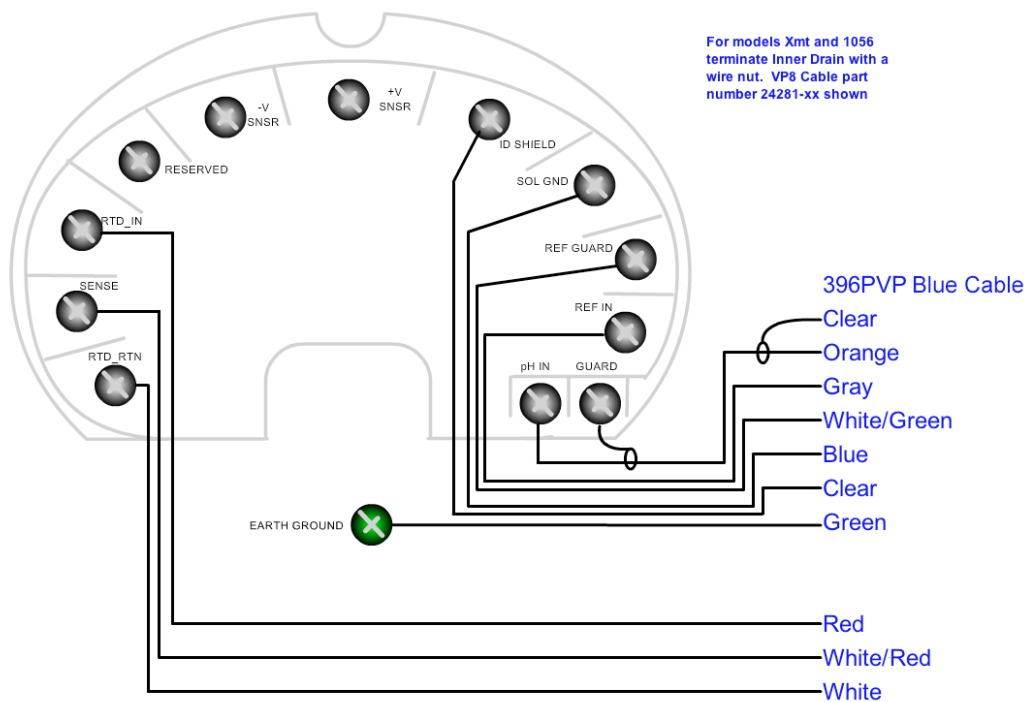
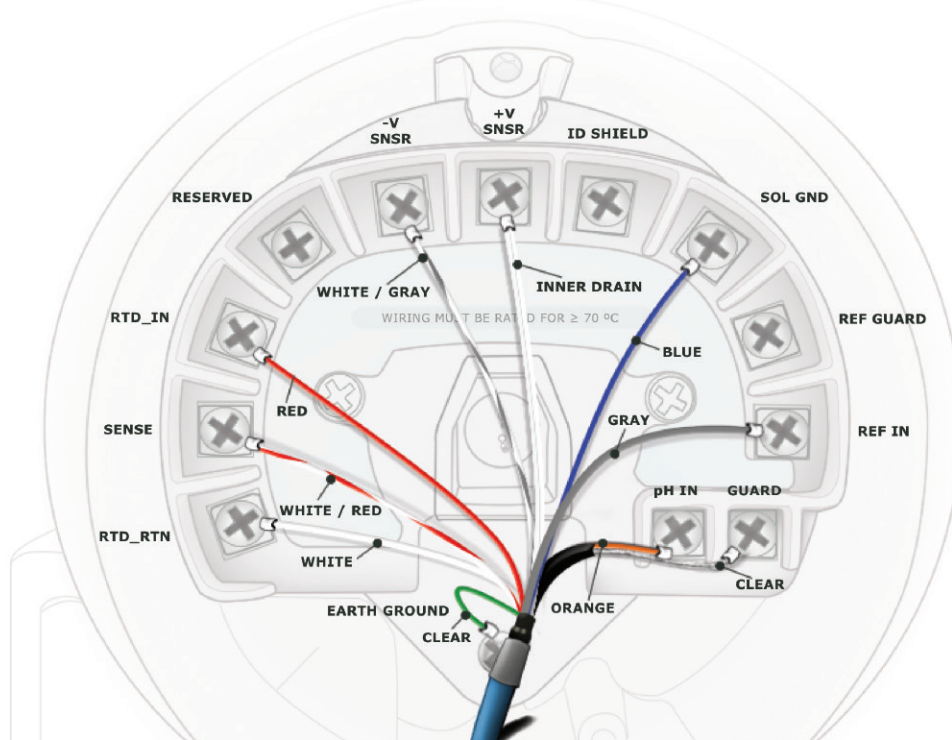


Figure 69. pH/ORP Sensor Wiring for 6081/3400HTVP-70 (Blue Cable)

pH / ORP SENSOR WIRING - 6081/3400HTVP-70 (Blue cable)
(Refer to manual for recommended order)





EC Declaration of Conformity

396P

We,

**Emerson Process Management
Heath Place - Bognor Regis
West Sussex PO22 9SH
England**

Declare under our sole responsibility that the product,

396P

manufactured by,

**Emerson Process Management
Rosemount Analytical
2400 Barranca Parkway
Irvine, California 92606
USA**

to which this declaration relates, is in conformity with the provisions of the European community Directives, including the latest amendments, as shown in the attached schedule.

Assumption of conformity is based on the application of the harmonized standards and, when applicable or required, a European Community notified body certification, as shown in the attached schedule.


(signature)

September 29, 2010

(date of issue)

Andy Kemish

(name printed)





Vice President Analytical, Europe

(function name printed)



Accessories

Part	Description
22698-00	Preamplifier plug-in for junction box, for 1003
22698-02	Preamplifier plug-in for junction box, for 1181, 1050
22698-03	Preamplifier plug-in for junction box for 1054 A/B, 2054, 2081
22743-01	Pt100 preamplifier for 1181
22744-01	3K Preamplifier for 1181
23557-00	Preamplifier for junction box for 54, 3081, 81, 4081
9210012	Buffer solution, 4.01 pH, 16 oz.
9210013	Buffer solution, 6.86 pH, 16 oz.
9210014	Buffer solution, 9.18 pH, 16 oz
R508-80X	ORP solution, 460 mv \pm 10 at 20 °C
12707-00	Jet Spray Cleaner
25645-07	15 ft. VP6 Cable
24281-00	15 ft. VP8 Cable
24281-01	25 ft. VP8 Cable
24281-02	2.5 ft. VP8 Cable
24281-03	50 ft. VP8 Cable
24281-04	100 ft. VP8 Cable
24281-05	4 ft. VP8 Cable
24281-06	10 ft. VP8 Cable
24281-07	20 ft. VP8 Cable
24281-08	30 ft. VP8 Cable

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